

Subject: Re: EGS abstract  
From: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>  
Date: 11/30/99 3:04 PM  
To: mhughes@ltrr.arizona.edu

Hi Malcolm,

I'm heading out on friday the 10th and will spend a couple days w/ friends of mine, then I check into the marriott on sunday evening (12th), and will be there for the whole week. Are you going to be there? When do you arrive?

Will send off the abstract...

mike

At 02:06 PM 11/30/99 -0700, you wrote:

> >Mike - the abstract looks fine to me. WHEN do you leave for San  
> >Francisco? CHEers, Malcolm  
> >Professor and Director  
> >Laboratory of Tree-Ring Research  
> >University of Arizona  
> >Tucson, AZ 85721  
> >phone 520-621-2191  
> >fax 520-621-8229  
> >e-mqil mhughes@ltrr.arizona.edu  
> >  
> >

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Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

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e-mail: mann@virginia.edu Phone: (804) 924-7770 FAX: (804) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.html>

Subject: Re: Fwd: Comments on Nov 23 USGCRP seminar

From: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>

Date: 12/2/99 11:08 AM

To: 091335371@t-online.de, vangeel@bio.uva.nl

CC: Arno Nldechen <trendenz@t-online.de>, jarl.ahlbeck@abo.fi, daly@vision.net.au, onar@netpower.no, Pat Michaels <pjm8x@wreck.evsc.virginia.edu>, rlindzen@mit.edu, baliunas@cfa.harvard.edu, roy.spencer@msfc.nasa.gov, dhoyt1@erols.com, Robinson <art@oism.org>, Rob\_Bradley@enron.com, jstringe@epri.com, wsoon@cfa.harvard.edu, norden@neptune.gsfc.nasa.gov, Ellsaesser <hughel@home.com>, robert.balling@asu.edu, Jim Goodridge <jdg@mcn.org>, gsharp@montereybay.com, Makiko Sato <makis@giss.nasa.gov>, rruedy@giss.nasa.gov, Bader <sba@sma.ch>, vinmary.gray@paradise.net.nz, Hughes <wsh@netwit.net.au>, cpaynter@greeningearthsociety.org, bpflann@erenj.com, Courtney <richard@courtney01.compulink.co.uk>, Svensmark <hsv@dsri.dk>, solanki@astro.phys.ethz.ch, M.Lockwood@rl.ac.uk, j.haigh@ic.ac.uk, Jack Barrett <100436.3604@compuserve.com>, HVolz@t-online.de, gerd-rainer.weber@gvst.de, ulrich.berner@bgr.de, Heinz.Hug@t-online.de, Krahmer@t-online.de, Gerd.Zelck@t-online.de, Grenier <fusion\_e@club-internet.fr>, Renato Quiones <rquinone@udec.cl>, Ehrhard.Raschke@gkss.de, hansjoerg.siegle@basf-ag.de, schoenwiese@meteor.uni-frankfurt.de, hille01m@erls1a.kwu.siemens.de, OWildgruber@csi.com, Dirk.Maxeiner@newsfactory.net, heinz.thieme@wibera.de, DrBaier@compuserve.com, abaier@geol.uni-erlangen.de, agerdes@marum.de, wnierenberg@ucsd.edu, c.defreitas@auckland.ac.nz, deckerf@ucs.orst.edu, milloy@cais.com, vanloon@cgd.ucar.edu, parker@odysseus.uchicago.edu, Nigel Calder <nc@windstream.demon.co.uk>, jtrefil@gmu.edu, hskhesh@dino.erenj.com, cathieadams@texaseagle.org, wbwhite@ucsd.edu, jthiede@geomar.de, sonja.b-c@geo.hull.ac.uk, Gernot.Patzelt@uibk.ac.at, pgrootes@leibniz.uni-kiel.de, h.heuseler@businessnet.de, Frank.Jauch@th-online.de, hampicke@rz.uni-greifswald.de, ulrich.katenkamp@bmbf.bund400.de, DMG A Spekat <as@zedat.fu-berlin.de>, wehry@bibo.met.fu-berlin.de, George Taylor <oregon@oce.orst.edu>, Craig Idso <co2@co2science.org>, Marlo Lewis <mlewis@cei.org>, m.manning@niwa.cri.nz, DRidenour@nationalcenter.org, john.horack@msfc.nasa.gov, JHand54137@aol.com, m.r.kok@hccnet.nl, hlinden@alpha1.ais.iit.edu, Curtis Covey <covey1@llnl.gov>, Charles F Keller <cfk@lanl.gov>, petit@glaciog.ujf-grenoble.fr, berger@astr.ucl.ac.be, frode.stordal@nilu.no, robock@envsci.rutgers.edu, ritson@slac.stanford.edu, spiro@zeus.nrl.navy.mil, Brian Farrell <bff@io.harvard.edu>, editor@globalchange.org, Michael Daly <arrow@redmesa.com>, hecht\_m@mediasoft.net, frank.oldfield@pages.unibe.ch, storch@gkss.de, heinloth@physik.uni-bonn.de, Gerhard Enders <BayForKlim@lrz.uni-muenchen.de>, kleinknecht@dipmza.physik.uni-mainz.de, Wilfried Hartmann <uv6a020@rrz.uni-hamburg.de>

Dear Dr. Dietz,

Though it is not my tendency to get caught up in such time-consuming email back-and-forths, I decided that it would be useful to correct the record, once and for all, on several misconceptions or errors that have been perpetuated on this and related email distributions. Owing to the pressures on my time this will have to be my only such response. I trust that the resources that I provide below, however, will assist those who are genuinely interested in the scientific details.

Judith Lean did an admirable job (and took valuable time out of her busy schedule) to respond to several of the points that were raised, but some of these require further comment. I have addressed these on a point-by-point basis below.

Before doing so, however, I would like to stress that honest scientific differences of opinion regarding climate variability and climate change research have always been, and will continue to be, essential. It's these types of checks and balances that give science its almost unique self-correcting tendency. Indeed, a healthy scientific dialogue regarding the underlying issues in paleoclimate reconstruction has occurred and is

occurring in the peer-reviewed literature, involving researchers such as Phil Jones, Keith Briffa, Tom Crowley, Judith Lean, David Rind, Jonathan Overpeck, Lloyd Keigwin, ourselves, and many others. However, statements of the sort made below, which blur the \*honest\* scientific differences of opinion with fallacies and misconceptions (ie, notions that have been clearly dismissed in the literature of the past 5-10 years) do little to encourage a meaningful dialogue. I would encourage those on this email distribution list to take careful note of such fallacies where I point them out.

sincerely,

michael mann.

At 03:02 PM 12/2/99 -0800, P. Dietze wrote:

> >Hello,

> >

[TEXT SKIPPED]

>>> >>

>>> >>> 3. How do you deal with the fact that Mike Mann has done away with the

>>> >>> Little Ice Age and medieval optimum in his latest work, where he shows the

>>> >>> "hockey stick " graph,

First of all, let's correct the record on the origin of the term "hockey stick" since it has been misrepresented in previous exchanges. This term was aptly coined by Jerry Mahlman to describe the fact that the warming of the 20th century follows a modest long-term cooling trend back to at least the beginning of the millennium at the hemispheric scale. The warming trend is indeed quite dramatic in the context of the "envelope" of century-scale variability that preceded it, and undoubtedly gives a "hockey stick" appearance. Lest one be left with the incorrect impression that the "Hockey Stick" is unique to our millennial annual mean Northern Hemisphere temperature reconstruction, be informed that Phil Jones more warm-season, extratropical-weighted Northern Hemisphere temperature reconstruction, and yet another largely-independent assessment of millennial temperature trends from Tom Crowley could be given the identical term. The "Hockey Stick" is simply, very likely, the shape that large-scale temperature trends over the past millennium have taken, like it or not...

>>> >>> graph YOU showed, in response to my question, was his earlier publication in which he only used tree rings.)

Where to start??...I have never published a proxy-reconstruction based on only tree ring data!! I'm not quite sure what the author of these comments is referring to. Those who are interested in the details of the proxy data underlying our climate reconstructions can find them here:

<http://www.people.Virginia.EDU/~mem6u/mbh98.html> (go to "Article" heading, and click on "Proxy Data" link)

Our proxy network made use of \*all\* high-resolution proxy records

ABOR/MH/Non-Priv-003

with replicated annual chronologies including coral isotopic, ice core (accumulation, isotopes, melt, chemistry...), dendroclimatic (mostly annual ring widths, also latewood density), historical, and the few long instrumental records, available back in time) which were available in the public domain/published literature at the time. The International Tree Ring Data Bank (ITRDB) was objectively filtered by Malcolm Hughes to retain only those tree ring chronologies which are well replicated and retain a century or longer timescale climate signal. Principal Component Analysis was applied to regional tree ring records to lower the statistical dimensionality of the tree ring data, and assure that our network was not overly weighted by dendroclimatic estimates. In a paper that is in the press [Mann, M.E., Gille, E., Bradley, R.S., Hughes, M.K., Overpeck, J.T., Keimig, F.T., Gross, W., Annual Temperature Patterns in Past Centuries: An interactive presentation, Earth Interactions, in press, 1999] we have shown that the overall northern hemisphere temperature trend IS LARGELY IDENTICAL IF WE OMIT ALL TREE RING DATA FROM THE RECONSTRUCTION. The main differences are in the interannual and decadal timescale variations, during which the more heterogenous structure of the dominant modes of variability on such timescales (e.g., ENSO) leads to non-trivial differences.

>>> >>> I am quite dubious about his claim; my proxy data (Jacoby ---tree rings, Dahl-Jensen --- ice bore >>> >>> holes) clearly show a LIA and NO warming since 1940!  
>>> >>>

I don't know how many times during the past 5-8 years the leading researchers in the field (Bradley, Jones, Hughes, etc.) have convincingly shown that the available global proxy climate data for the past thousand years do not support the outdated notion of a uniform hemispheric or global "Little Ice Age" or "Medieval Warm Period" coinciding with the corresponding European-defined intervals. Rather, as is evident in our and other assimilations of global proxy data networks, temperature anomalies are dramatically variable from region to region. The North Atlantic and neighboring regions are notorious in this regard, in that the sensible heat transport by patterns of variability such as the NAO have such a strong overprint in certain regions (Greenland, Europe, Middle East for example) that, depending on the phase of the NAO, temperature patterns in these regions can be entirely out-of-step with larger-scale temperature patterns. Any objective climate scientist knows that that inferences into hemispheric patterns of variability from North Atlantic or European regional information is impossible.

If we sample our reconstructions (also in the in-press article referred to above) by averaging our patterns over the latitude band north of 30 degrees (to more closely approximate Phil Jones reconstruction) we observe a greater cooling prior to the 20th century, in close agreement (WELL within the error bars) of the Jones et al (1998) reconstruction. The conclusion is that the cooling of the past few centuries was greatest in mid and high-latitudes. Moreover, regional averages of our pattern reconstructions over North America and Europe show distinct differences, consistent w/ the influence of the patterns such as the NAO (although the influence of the

NAO in the annual mean is quite modest) and decadal patterns of North Atlantic variability that are superimposed on larger-scale features of the climate. It is clear for example, that cooling in North America was probably greater than 1 C during the 19th century, with Europe experiencing colder conditions, rather, during the 17th century.

In short in our, and Phil Jones reconstructions, there is nothing AT ALL that is inconsistent w/ our past notions of European or North American climate change.

What is new is that we have the data and methods to assimilate global networks of proxy data. These large-scale assimilations show that many of the pronounced anomalies we're so familiar w/ from regional information tend to average out over the hemisphere let alone globe. Certain claims that have been made in this or related email distributions is that our methodology somehow "erases" the "Little Ice Age" and "Medieval Warm Period". This is almost so silly that it doesn't deserve acknowledgement, but the associated preconception is dangerous. Our reconstructions describe, most efficiently, the leading large-scale patterns of climate influence. Those patterns (such as the NAO) which are largely cold-season, and largely extratropical, can clearly be shown to have little influence on true (0-90N), annual mean (Jan-Dec) northern hemisphere temperature, although we reconstruct them quite effectively nonetheless! The correlation during the 20th century between the NAO index and northern hemisphere annual mean temperature is  $r=0.3$  (about 10% resolved variance). This is in contrast with more prominent influence (about 30% resolved variance) if one is confined north of 30N and only to the winter season. Clearly, it is patterns such as the NAO which are likely to have given rise to enhanced anomalies in particular regions (such as Europe) in the past. The idea, however, that such patterns would significantly project onto true annual-mean global or hemispheric temperatures is inconsistent with everything we know about the climate system.

The long-term cooling of the Northern Hemisphere prior to the 20th century is consistent with a combination of astronomical factors and, as Judith Lean has rightly pointed out, a possible contribution from a lowering of solar irradiance during the same time frame. The latter, which is peaked indeed during Medieval times, is consistent w/ enhanced Medieval warmth in Europe. A variety of analyses (model-based, and diagnoses of our pattern reconstructions) show that the response to solar forcing is considerably enhanced in certain regions (e.g. Eurasia and parts of North America) and small or absent in many others.

>>> >This is difficult - I thought that I had the latest Mike Mann  
>>> >reconstruction but based on your comments (thanks) I will check this out  
>>> >further. I believe that the paleo folks acknowledge significant  
>>> >uncertainties in their reconstructions, especially prior to about 1700.

Like  
>>> >you, I am aware of a variety of climate proxies that do have more pronounced  
>>> >variability than the Hockey stick shows. Certainly, some of the individual  
>>> >records that comprise Mike's reconstruction do show patterns of correlation  
>>> >with solar activity that are similar to those predicted by models (his  
>>> >graduate student Anne Waple has written a paper on this). I guess we

need to

>> > wait to see if the Mike Mann reconscution is validated or not. This may

>> > take a while, as its a difficult task from what I can gather.

> >

> > YES. IT'LL TAKE A SPECIALIST TO CHECK UP ON MIKE'S SELECTION OF DATA

> > (SUBJECTIVE??) AND HIS ANALYSIS.

> >

The "specialists" have largely confirmed out key findings by performing similar reconstructions based on independent data and methodologies, and coming to largely the same conclusions. With regard to the the objectiveness of the data selection,

I challenge the author of these comments to point out the high-resolution proxy data records in the public domain that are left out of the list of proxy data we used (I refer the reader back to the earlier web site). With regard to more general issues of validation, etc. the cross-validation excercises which we detail in our publications provide very good evidence that our reconstructions are skillfull, and that our estimates of the \*uncertainties\* in our reconstructions are quite reasonable. Further work will seek to decrease those uncertinaties (which are considerable back in time, though not so considerable that we can't conclude that there is a very good fighting change that the 1990s are the warmest decade of the millenium). The only way to decrease these uncertainties will be to to use expanded proxy data networks, and refining the methodologies (using, for example, frequency-domain techniques to capture propogating as well as standing patterns of climate variability, and using to perform hybrid frequency-band calibrations/reconstructions). Furthermore, tests (e.g., of the influence of non-stationarity in the determination of data covariances used to infill sparse data back in time), and other relevant comparisons are being done w/ long coupled model integrations to investigate the strengths and weaknesses of different climate reconstruction approaches under different climate change and climate variability scenarios.

There is much room for healthy scientific discourse as such research proceeds. There also, apparently, is lots of room for disinformation. I trust that the majority of the individuals on this distribution list prefer the former.

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<http://www.evsc.virginia.edu/faculty/people/mann.html>

Subject: Re: piece  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 12/6/99 5:02 PM  
To: mhughes@ltrr.arizona.edu

HI Malcolm,

Probably makes more sense for me to just give it to you at AGU. I'm supposed to meet up /w Ed Cook on Monday, but maybe it would be cool for the 3 of us to get together then? We'll all be staying in the Marriott.

If you need a a copy of the paper in an emergency, you can download a pdf or ps camera-ready version from my website (follow links from my homepage). Let me know if you need a hardcopy reprint prior to AGU, and I can put it in the mail tomorrow...m

At 03:26 PM 12/6/99 -0700, you wrote:

> >Mike - a) I'll be checking into the SF Marriott close to 9 on Monday  
> >evening - might this be too late to get together?  
> >b) I've foolishly let go of my last reprint of the GRL paper - do you  
> >have another one you could put in the mail so I can make copies?  
> >Thanks, Malcolm  
> >Professor and Director  
> >Laboratory of Tree-Ring Research  
> >University of Arizona  
> >Tucson, AZ 85721  
> >phone 520-621-2191  
> >fax 520-621-8229  
> >e-mqil mhughes@ltrr.arizona.edu  
> >  
> >

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<http://www.evsc.virginia.edu/faculty/people/mann.html>

Subject: away from my mail  
From: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>  
Date: 12/19/99 10:48 PM  
To: mhughes@ltrr.arizona.edu

I will not be reading my mail from 12/10/99-12/18/99.

Your mail concerning "IPCC TAR"  
will be read when I'm back.

Subject: workshop  
From: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>  
Date: 2/25/00 1:44 PM  
To: mhughes@ltrr.arizona.edu

Dear Malcolm,

I'm a co-organizer w/ Vikram Mehta, Tom Delworth, and others in a NASA workshop on decadal variability to be held in Hawaii Jan 8-12, next year, and have room for a few slots on the paleo aspects. I put your name as an invited participant.  
I hope you can make it?

mike

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Subject: Re: thoughts?  
From: Malcolm Hughes <mhughes@lrr.arizona.edu>  
Date: 6/6/00 9:46 AM  
To: "Michael E. Mann" <mann@virginia.edu>

Dear Mike - yes , I'm here those days, Malcolm

Subject: Re: thoughts?  
From: Malcolm Hughes <mhughes@ltrr.arizona.edu>  
Date: 6/6/00 6:02 PM  
To: "Michael E. Mann" <mann@virginia.edu>  
CC: srutherford@virginia.edu

Mike - consider it done, Malcolm

Subject: fedex details  
From: Malcolm Hughes <mhughes@ltrr.arizona.edu>  
Date: 6/26/00 3:43 PM  
To: mann@virginia.edu

Whoops! FOrgot my fedex details:

Fedex/UPS shipping address:  
Malcolm K. Hughes  
Harvard Forest  
324 N. Main Street  
Petersham, MA 01366  
Tel: 978-724-3302

Subject: IPCC misinterpretation of Bradley/Mann results requires correction  
From: "Michael E. Mann" <mann@holocene.evsc.virginia.edu>  
Date: 7/12/00 12:48 PM  
To: mhughes@ltrr.arizona.edu

> >X-Sender: ssinger1@osf1.gmu.edu  
> >X-Mailer: QUALCOMM Windows Eudora Version 4.3.1  
> >Date: Wed, 12 Jul 2000 09:52:30 -0400  
> >To: rbradley@geo.umass.edu, mann@virginia.edu  
> >From: "S. Fred Singer" <singer@sepp.org>  
> >Subject: IPCC misinterpretation of Bradley/Mann results requires  
> > correction  
> >Cc: onar@netpower.no, jarl.ahlbeck@abo.fi, arking@aa.gsfc.nasa.gov,  
> > sbaliunas@cfa.harvard.edu, robert.balling@asu.edu,  
> > gcb@lamont.lidgo.columbia.edu, pbrekke@esa.nascom.nasa.gov,  
> > John Christy <christy@atmos.uah.edu>, richard@courtney01.cix.co.uk,  
> > daly@vision.net.au, red3u@virginia.edu, 091335371-0001@t-online.de,  
> > hughel@home.com, Tor Ragnar Gerholm <lena.goransson@kreab.se>,  
> > gray@typhoon.atmos.colostate.edu, vinmary.gray@paradise.net.nz,  
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> > Dan Imre <imre@bnl.gov>, karlen@natgeo.su.se, pck4s@nhes.com,  
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> > rmckit@css.uoguelph.ca, pjm8x@rootboy.nhes.com, wnierenberg@ucsd.edu,  
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> > hartwig.volz@rwedea.de, gerd-rainer.weber@gvst.de,  
> > David Wojick <dwojick@shentel.net>,  
> > "John M. (Mike) Wallace" <wallace@atmos.washington.edu>,  
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rkerr@aaas.org,  
> > somer1@meteora.ucsd.edu, cdkeeling@ucsd.edu, k.briffa@uea.ac.uk,  
> > berger@astr.ucl.ac.be  
> >  
> >

> >Dear Ray and Mike,  
> >

> >This letter replies to Ray's initial letter of June 25 and Mike's of June  
> >26 (appended below). It does not address some of the methodological  
> >problems we have with your work. Nor does it delve into the debate on  
> >whether the Little Ice Age and Medieval Warming Epoch were global or  
> >regional. We will present those topics to you at a later time; and I'm  
> >sure you will have a good response.  
> >

> >Here I am concerned only with what I consider to be the KEY ISSUE: \*\*\*The  
> >use of your scientific work and publications to advance the claim that the  
> >past century, and past decade, were the warmest in the last 1000  
> >years.\*\*\* This claim, in turn, has been used by the IPCC Third Assessment  
> >Report (TAR) to conclude that there has been a discernible human influence  
> >on global climate. According to Kerr (Science, 28 April 2000), if those  
> >words hold up under further expert and governmental reviews, they will be  
> >the strongest official pronouncement yet that human--induced warming is

real.â€

>>  
>>As you probably know, I organized a workshop here in Fairfax, VA last May  
>>and invited some dozen climate experts to join me in critically analyzing  
>>the second draft of the IPCC TAR. Many of them, myself included, were  
>>reviewers of the first draft. We focused on different issues, reflecting  
>>the specialties of the participants. One issue we discussed was the IPCCâ€™s  
>>use of your recent Nature (1998) and GRL (1999) papers.

>>  
>>Our concern here is that your results have been misinterpreted, probably  
>>through no fault of yours. While your GRL publication clearly states (in  
>>the figure caption and elsewhere) that your multi-proxy (tree ring, etc.)  
>>record stops in 1980 and that the post-1980 warming shown in your graph  
>>reflects only the instrumental (thermometer) record, this admonition has  
>>been widely disregarded. Since I question this instrumental post-1980  
>>warming (see below), I see nothing very unusual about the 20th century.

>>  
>>(Let me state here that I do not question the pre-1940 instrumental record,  
>>which seems to be adequately supported by a variety of proxy data, even  
>>though we have no independent support from radiosondes or satellites. Nor  
>>is there much debate about the reality of NH cooling between 1940 and 1975  
>>and the sharp temperature increase in the late 1970s.)

>>  
>>I now cite some examples of misinterpretation of your work:

>>  
>>1. The IPCC Summary for Policymakers (SPM) shows your graph (the  
>>temperature record from 1000 to 2000 AD) as Figure 1. [See  
>>attachment] However, the caption does not explain that it is a COMPOSITE  
>>record. It simply says: â€œthe warming during the 20th Century has been  
>>atypical compared to the rest of the past 1000 years. The rate and  
>>duration of the warming is likely to have been the largest of the  
>>period.â€ The implication clearly is that the proxy record independently  
>>confirms the post-1980 warming of the instrumental record, shown with your  
>>proxy record in the same Figure 1.

>>  
>>2. The IPCC Technical Summary shows your graph as Figure 5 and clearly  
>>identifies the superposition of the reconstructed proxy record and the  
>>instrumental data. However, this matter is then disregarded in the  
>>text: â€œMoreover, several different analyses have now been completed, each  
>>suggesting that the northern hemisphere temperatures OF THE PAST DECADE  
>>have been warmer than any other time in the past 6 to 10 centuries.â€ (TS,  
>>p.7, 34-36; emphasis added). I believe that this assertion is quite  
>>incorrect and misleading; whether intentional or unintentional, it is a  
>>misinterpretation of your work.

>>  
>>Several different experts have also been misled by the superposition of the  
>>two records and have assumed, implicitly, that the proxy record  
>>independently supports the post-1980 instrumental record.

>>  
>>Richard Kerr, an astute and expert commentator on climate matters, reprints  
>>your graph properly, but then states: â€œThree different records of  
>>temperatures preserved in tree rings and elsewhere have now revealed the  
>>large, abrupt 20th century warming to be unique in the past 1000  
>>years.â€ Of course, this would only be the case if one accepts the

> >post-1980 instrumental record as a genuine measure of post-1980 climate.

> >

> >Tyson et al. (So. Afr. J Sci 96, 121-126, 2000) reprints your graph (as  
> >Figure 3 on p. 123) and refer to it as a "NH-averaged multiproxy anomaly  
> >series" without noting that it is a composite graph. Another recognized  
> >climate expert, Peter deMenocal (Science 288, 2198-2202, 2000), simply  
> >says, in quoting your work, that "the warming in recent decades is  
> >unprecedented relative to the past millennium."

> >

> >Evidently, the interpretation widely given to your results depends on  
> >assuming both that proxies and instruments measure the same quantities and  
> >that there is close agreement between them after 1980. Yet there is a  
> >prima-facie case that the instrumental data of recent decades are  
problematic:

> >

> >1. As noted in the National Research Council (NRC) report of January  
> >2000, the atmosphere itself does not exhibit an appreciable global warming  
> >trend in the past 20 years. The NRC report notes the disparity of both  
> >balloon and satellite trends with the surface data, but does not explain  
> >it. We have now reanalyzed all the trend data in more detail and confirm  
> >the disparity between the surface, on the one hand, and the atmospheric  
> >trend data derived from satellites and radiosondes (which agree closely  
> >with each other).

> >

> >2. The well-controlled and rather reliable surface data for the United  
> >States exhibit no noticeable warming trend since about 1940, in  
> >contradiction to the GLOBAL surface data. This clearly suggests that the  
> >claimed warming is concentrated in other regions, including the  
> >tropics. (This is very strange, since GH theory predicts that trends  
> >should be minimal at low latitudes.).

> >

> >3. The NRC report shows that the major surface warming (since 1979)  
> >occurred in Northern Siberia and the sub-polar region of Alaska and  
> >Canada. But the proxy data from these same regions show no warming since  
> >1940; and some even show a cooling trend. I have now assembled a number of  
> >tree-ring data and ice-core temperature readings that confirm this and  
> >>would be happy to share these with you.

> >

> >According to your June 26 letter, you have not used post-1980 proxy data  
> >because, as you state, "these chronologies have not been updated into  
> >recent decades." (You then make the cryptic remark that "certain  
> >proxies exhibit some unusual behavior during this most recent  
> >interval." Are you referring here to the data of Briffa et al.?) You  
> >consider "the issue is essentially irrelevant to our work". An adequate  
> >network to do what we have done is not available to extend our  
> >reconstructions into the "90s."

> >

> >Now this reply does not really address my original question to Ray. It is  
> >>true that you don't need post-1980 proxy data to do the calibration  
> >required for proxy reconstruction. But it may also be true that if you had  
> >looked at the post-1980 proxy data, as I have done and am doing, you would  
> >find that they do not support the post-1980 instrumental record. In that  
> >case, of course, you may have to revise the calibration used for your  
> >reconstruction scheme.

> >  
> >More to the point, if the post-1980 proxy record and the post-1980  
> >instrumental record are not substantially identical, your results will not  
> >support the weight of conclusions being placed upon them by the IPCC and  
> >others. This matter should be of paramount importance to you, since it  
> >will determine the ultimate scientific validity of your results.

> >  
> >It seems to me, therefore, that you now have an obligation to investigate  
> >whether the post-1980 proxy data confirm the instrumental record. And if  
> >you come to the same conclusion that I have, then you should publish your  
> >report and make the IPCC and scientific community at large aware of this  
> >fact. I hope you will agree that this is an important requirement of  
> >scientific integrity.

> >  
> >Cordially yours,

> >  
> >Fred  
> >\*\*\*\*\*

> >  
> >At 03:48 PM 6/26/00 -0400, Mann wrote:

> >  
> >Dear Fred,

> >  
> >Apparently, then, you were misquoted in the papers, and might want to be  
> >more circumspect in dealing with the media in the future.

> >  
> >I make it a habit of generally not responding to these types of emails,  
> >because most of us are simply too busy w/ research and other  
> >responsibilities to get embroiled in exchanges, many of which could be  
> >avoided simply by a careful reading of the published literature. But there are  
> >some misconceptions, which have been widely spread by you and some others  
> >regarding our work, that merit a correction of the record:

> >  
> >We have never in any way suggested that our proxy-reconstructed series extends  
> >beyond 1980. This is a misconception that perhaps arises from those who  
> >have not read the captions and legends of our graphics carefully.

> >  
> >As discussed in detail in our '98 Nature article, including the  
> >supplementary on-line information which details the beginning and ending  
> >dates of all proxy records used in our network, it is an unfortunate  
> >consequence of the history of the science that very few proxy series have  
> >been updated into the '90s. The vast amount of tree ring work, for example,  
> >was done in the '70s and '80s, and these chronologies have not been updated  
> >into recent decades [this would take a huge amount of effort to do,  
> >although it is clearly worthwhile!]. It is an interesting, though  
> >unrelated matter, that certain proxies, in particular high-latitude tree  
> >ring density chronologies (of which we used very few, but which form the  
> >basis for e.g. the Briffa et al reconstructions) have been shown in recent  
> >work to exhibit some unusual behavior during this more recent interval. We  
> >have, however, used none of the data used by Briffa et al (and only a few  
> >density chronologies at all!) in our own reconstructions, and the issue is  
> >essentially irrelevant to our work. Most of the coral series, and many of  
> >the ice core series in our network, end in the late 70s/early 80s. So, in  
> >short, an adequate network to do what we have done, is not available to

> >extend our reconstructions into the 90s.  
> >  
> >Instead, what he have shown is that our calibration based on the best  
> >available overlap period for the instrumental and proxy data sets  
> >(1902-1980) allows for a successful reconstruction of an earlier  
> >independent though sparser "verification" interval of the instrumental  
> >record (1854-1901) [in response to a specific question of yours: even a  
> >cursory reading of our papers shows that, of course, our proxy-based  
> >temperature reconstructions reproduce the post-1940 warming and, in fact,  
> >roughly 70-80% of the total variance throughout the calibration and  
> >verification intervals]. The verification or "cross-validation" and  
> >various additional related diagnostics of our reconstructions (including  
> >much longer verification in selected regions where much longer instrumental  
> >records are available, such as Europe) makes a strong case our  
> >reconstructions are skillful, and unbiased, and allow us to  
> >self-consistently estimate the uncertainties in the reconstructions. Doing  
> >so allows us to appropriately frame uncertain estimates from our  
> >temperature reconstructions with the considerably less uncertain estimates  
> > from the instrumental record (available through the present), in a  
> >careful, and statistically-controlled manner. I believe that this is all  
> >quite clearly spelled out in our papers, and I regret that you continue to  
> >apparently misunderstand these important and fundamental aspects of our work.

> >  
> >I would recommend, given what is still clearly an incomplete understanding  
> >of our methodology on your part, that you refrain from inflammatory remarks  
> >regarding ours, or others, research, without checking the facts beforehand.  
> >I am happy to help direct you to the appropriate resources for doing so.

> >  
> >Best regards,

> >  
> >mike mann

> >\*\*\*\*\*

> >At 09:27 AM 6/26/00 -0400, S. Fred Singer wrote:

>> >Dear Ray

>> >>

>> >>I certainly don't recall ever characterizing yr work as dishonest. I would  
>> >>never do this, and you should not accept hearsay on such a matter.

>> >>

>> >>I do consider it misleading, however, to join the instrumental record to a  
>> >>proxy record (which stops in 1980), and then show a temperature rise from  
>> >>1980 onward. Many people seem to be under the impression that yr post-1980  
>> >>proxy record confirms the reported instrumental warming .

>> >>

>> >>Since you have now raised the issue, I would like to ask you: Do you have  
>> >>published evidence FROM YOUR PROXY RECORDS that shows temperatures  
>> >>increasing after 1980 (or for that matter after 1940)?

>> >>

>> >>I await your reply and will gladly adjust my position based on the  
evidence.

>> >>

>> >>With best wishes,

>> >>

>> >>Fred

>> >>\*\*\*\*\*

>>>>  
>>>>At 03:39 PM 6/25/00 -0400, Bradley wrote:  
>>>>>>I don't wish to get into a prolonged debate about paleo-records of  
>>>>>>climate, but perhaps you could explain to me why it is that you and your  
>>>>>>colleagues repeatedly point to a small number of records --e.g. the  
>>>>>>Greenland borehole data, or Keigwin's poorly dated Sargasso Sea record --  
>>>>>>as evidence that the globe as a whole was warmer 1000 years ago. Roughly  
>>>>>>speaking the entire North Atlantic region makes up only about 10% of the  
>>>>>>surface area of the earth.  
>>>>>>You may be right -- perhaps it was warmer then, but you should be more  
>>>>>>forthright in stating what your evidence really means.  
>>>>>>Incidentally, you were reported as saying that the work of Mann, Bradley &  
>>>>>>Hughes was dishonest. Feel free to disagree, but let's keep the debate  
>>>>>>civil.

>>>>>>  
>>>>>>Thanks  
>>>>>>  
>>>>>>Ray Bradley  
>>>>>>  
>>>>>>  
>>>>>>Raymond S. Bradley  
>>>>>>Professor and Head of Department  
>>>>>>Department of Geosciences  
>>>>>>University of Massachusetts  
>>>>>>Amherst, MA 01003-5820  
>>>>>>Tel: 413-545-2120  
>>>>>>Fax: 413-545-1200  
>>>>>>Climate System Research Center: 413-545-0659  
>>>>>>Climate System Research Center Web Site:  
>>>>>><<<http://www.geo.umass.edu/climate/climate.html>>>  
>>>>>>\*\*\*\*\*

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>>>>>> Professor Michael E. Mann  
>>>>>> Department of Environmental Sciences, Clark Hall  
>>>>>> University of Virginia  
>>>>>> Charlottesville, VA 22903

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>>>>>> e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (804) 924-7770 FAX: (804) 982-2137  
>>>>>> <http://www.evsc.virginia.edu/faculty/people/mann.html>

>>>>>> Attachment Converted: "c:\eudora\attach\SPM\_page8.pdf"

>>>>>> S. Fred Singer, President  
>>>>>> Science & Environmental Policy Project  
>>>>>> 9812 Doulton Court  
>>>>>> Fairfax, VA 22032  
>>>>>> <http://www.sepp.org>  
>>>>>> Tel: 703-503-5064  
>>>>>> e-fax 815-461-7448 (your fax will be sent as email to my  
>>>>>> computer)

>>>>>>\*\*\*\*\*

> >"The improver of natural knowledge absolutely refuses  
> >to acknowledge authority, as such. For him, scepticism  
> >is the highest of duties; blind faith the one unpardonable sin."  
> >Thomas H. Huxley  
> >\*\*\*\*\*

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University of Virginia  
Charlottesville, VA 22903

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e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (804) 924-7770 FAX: (804) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.html>

Subject: getting together  
From: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>  
Date: 8/8/00 11:04 AM  
To: rbradley@geo.umass.edu, mhughes@ltrr.arizona.edu  
CC: srutherford@virginia.edu

Hi Ray, Malcolm,

I get into town late Thursday (10th), but all of Friday (11th) afternoon is free. Hoping we can get together on Friday. How are your schedules? I'll be at URI from Saturday (12th)-Tuesday (15th), returning tuesday afternoon. I'll then be in town on the 16th (wedns) and 17th (thurs) before departing on the 18th (friday). I was going to suggest that Scott come up for a day (free to stay overnight w/ me) and we all have a "project meeting" on perhaps the 16th?

Please let me know how the above sounds, and if there are any conflicts w/ any of this. Thanks,

mike

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e-mail: mann@virginia.edu Phone: (804) 924-7770 FAX: (804) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.html>

Subject: Re: getting together  
From: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>  
Date: 8/8/00 12:02 PM  
To: Malcolm Hughes <mhughes@ltrr.arizona.edu>

Hi Malcolm,

Good deal--I've got 'em all on the cell phone. What's say we plan to meet  
friday morning, Rao's around 10:30 or so as a default plan?

mike

At 11:52 AM 8/8/00 -0700, you wrote:

> >Dear Mike - I'm around at all of those times. A reminder of my phone  
> >number:  
> >home (until end of August) [REDACTED]  
> >Harvard Forest 978-724-3302 ext. 255  
> >cell [REDACTED]  
> >The home number is the most reliable one touse, with the voice mail  
> >that works. Cheers, Malcolm  
> >Malcolm Hughes  
> >Professor of Dendrochronology  
> >Laboratory of Tree-Ring Research  
> >University of Arizona  
> >Tucson, AZ 85721  
> >520-621-6470  
> >fax 520-621-8229  
> >  
> >

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---

e-mail: mann@virginia.edu Phone: (804) 924-7770 FAX: (804) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.html>

Subject: Re: getting together  
From: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>  
Date: 8/8/00 1:08 PM  
To: Malcolm Hughes <mhughes@ltrr.arizona.edu>

Hi Malcolm,

We could plan to meet in the afternoon say 2ish? Will have my cell phone w/  
me, so we can leave it a bit flexible, and just coordinate when I'm in town...

mike

At 12:56 PM 8/8/00 -0700, you wrote:

> >Mike - I probably need to be at Harvard Forest Friday a.m. if poss,  
> >so early afternoon would be better, Cheers, Malcolm  
> >Malcolm Hughes  
> >Professor of Dendrochronology  
> >Laboratory of Tree-Ring Research  
> >University of Arizona  
> >Tucson, AZ 85721  
> >520-621-6470  
> >fax 520-621-8229  
> >  
> >

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<http://www.evsc.virginia.edu/faculty/people/mann.html>

Subject: Re: getting together  
From: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>  
Date: 8/8/00 1:50 PM  
To: Malcolm Hughes <mhughes@ltrr.arizona.edu>

Sounds good to me. Don't know about you, but I'm sure I'll need a Grande Mocha about 2pm...Lets say 2pm Raos,

mike

At 01:37 PM 8/8/00 -0700, you wrote:

> >Mike - OK - Rao's? Malcolm  
> >Malcolm Hughes  
> >Professor of Dendrochronology  
> >Laboratory of Tree-Ring Research  
> >University of Arizona  
> >Tucson, AZ 85721  
> >520-621-6470  
> >fax 520-621-8229  
> >  
> >

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<http://www.evsc.virginia.edu/faculty/people/mann.html>

Subject: amherst mtg  
From: "Raymond S. Bradley" <rbradley@geo.umass.edu>  
Date: 8/9/00 7:11 PM  
To: mann@multiproxy.evsc.virginia.edu, mhughes@ltrr.arizona.edu

I could meet Friday am or next week, 16/17/18--whatever is best for everyone.  
ray

Raymond S. Bradley  
Professor and Head of Department  
Department of Geosciences  
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Amherst, MA 01003-5820

Tel: 413-545-2120

Fax: 413-545-1200

Climate System Research Center: 413-545-0659

Climate System Research Center Web Page: <<http://www.geo.umass.edu/climate/climate.html>>

Paleoclimatology Book Web Site (1999): <http://www.geo.umass.edu/climate/paleo/html>

Subject: Re: amherst mtg  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 8/9/00 8:21 PM  
To: "Raymond S. Bradley" <rbradley@geo.umass.edu>  
CC: mhughes@ltrr.arizona.edu

Malcolm and I are planning on meeting at Raos Friday afternoon, 2ish. Lets also try to plan to have a meeting on the 16th w/ Scott. Will try to arrange that, and keep you in the loop...

mike

At 10:11 PM 8/9/00 -0400, you wrote:

> >I could meet Friday am or next week, 16/17/18--whatever is best for everyone.

> >ray

> >

> >

> >Raymond S. Bradley

> >Professor and Head of Department

> >Department of Geosciences

> >University of Massachusetts

> >Amherst, MA 01003-5820

> >

> >Tel: 413-545-2120

> >Fax: 413-545-1200

> >Climate System Research Center: 413-545-0659

> >Climate System Research Center Web Page:

> ><<http://www.geo.umass.edu/climate/climate.html>>

> >Paleoclimatology Book Web Site (1999):

> ><http://www.geo.umass.edu/climate/paleo/html>

> >

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> >

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<http://www.evsc.virginia.edu/faculty/people/mann.html>

Subject: Re: GDI2 idea  
From: tom crowley <tom@ocean.tamu.edu>  
Date: 8/21/00 7:54 AM  
To: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>  
CC: mhughes@ltrr.arizona.edu

Mike and Malcolm,

check out J Climate 1994 March issue, p. 361-374 - article by Keith Young on harmonic analysis of Arizona tree ring records yielding 70 year cycle - he does not discuss Schlesinger and Ramankutty paper because I think his paper may already have been in press when the S + R paper came out (or maybe even preceded it). His Fig 13 shows the time variations of that cycle. Cant tell from eyeballing it how well it agrees with RPC5.

Tom

Thomas J. Crowley  
Dept. of Oceanography  
Texas A&M University  
College Station, TX 77843-3146  
979-845-0795  
979-847-8879 (fax)  
979-845-6331 (alternate fax)

Subject: Re: GDI2 idea  
From: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>  
Date: 8/21/00 8:42 AM  
To: tom crowley <tom@ocean.tamu.edu>  
CC: mhughes@ltr.arizona.edu

Hi Tom,

Thanks for the info. Yes, in fact, the Mann and Park '94 paper was in review and in revision for more than a year before it appeared in 1994, so he probably wasn't aware of that either.

Will be interesting to hear Malcolm's thoughts on this?

mike

At 09:54 AM 8/21/00 -0500, tom crowley wrote:

> >Mike and Malcolm,  
> >  
> >check out J Climate 1994 March issue, p. 361-374 - article by Keith Young  
> >on harmonic analysis of Arizona tree ring records yielding 70 year cycle -  
> >he does not discuss Schlesinger and Ramankutty paper because I think his  
> >paper may already have been in press when the S + R paper came out (or  
> >maybe even preceded it). His Fig 13 shows the time variations of that  
> >cycle. Cant tell from eyeballing it how well it agrees with RPC5.

> >  
> >Tom

> >  
> >  
> >  
> >  
> >Thomas J. Crowley  
> >Dept. of Oceanography  
> >Texas A&M University  
> >College Station, TX 77843-3146  
> >979-845-0795  
> >979-847-8879 (fax)  
> >979-845-6331 (alternate fax)

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e-mail: mann@virginia.edu Phone: (804) 924-7770 FAX: (804) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.html>

Subject: OGP announcement

From: Malcolm Hughes <mhughes@ltrr.arizona.edu>

Date: 8/31/00 2:53 PM

To: Michael E. Mann <mann@multiproxy.evsc.virginia.edu>, Raymond S. Bradley <rbradley@geo.umass.edu>

Gentlemen - direct from Mark Eakin, please find attached this year's OGP announcement. Cheers, Malcolm

Attachments:

C:\Projects\Bradley and Mann\2000 project\ogpfedreg01.pdf

Subject: Re: charlotteville paleo workshop  
From: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>  
Date: 9/18/00 7:50 AM  
To: Hans von Storch <Hans.von.Storch@gkss.de>, Nanne Weber <weber@knmi.nl>, Oyvind Nordli <Oyvind.Nordli@dnmi.no>, Heinz Wanner <wanner@giub.unibe.ch>, Joerg Negendank <neg@gfz-potsdam.de>, miller@awi-bremerhaven.de  
CC: rbradley@geo.umass.edu, jto@u.arizona.edu, drdendro@ldeo.columbia.edu, mhughes@ltrr.arizona.edu, woodhouse@ngdc.noaa.gov, mark.eakin@noaa.gov, tom@ocean.tamu.edu

Hans,

That seems fine to me--I know of no conflicts with those dates. However, I've forwarded to a few of my U.S. colleagues to let me know if they know of any conflicts which would prevent participation in the workshop on those dates from the U.S. side...

mike

At 11:39 AM 9/18/00 +0200, Hans von Storch wrote:

> >Folks,  
> >it seems that we have a problem with the dates of the planned  
> >Charlottesville meeting. At the same time the European Union of  
> >geosciences is meeting, and many of our geoscience colleagues will have  
> >to go there.  
> >What about postponing the meeting to 17-20 April?  
> >  
> >--  
> >  
> >Hans von Storch  
> >  
> >Institute of Hydrophysics  
> >GKSS Research Center, Max-Planck-Strasse 1, PO Box,  
> >WWW: <http://w3g.gkss.de/G/Mitarbeiter/storch/>  
> >e-mail: [storch@gkss.de](mailto:storch@gkss.de) and [storch@dkrz.de](mailto:storch@dkrz.de)  
> >Phone: + 49 / 4152 87 1831, fax: + 49 / 4152 87 2832  
> >privat fax: XXXXXXXXXX  
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<http://www.evsc.virginia.edu/faculty/people/mann.html>

Subject: EI article  
From: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>  
Date: 11/1/00 12:03 PM  
To: rbradley@geo.umass.edu, epg@ngdc.noaa.edu, mhughes@ltrr.arizona.edu, jto@u.arizona.edu

Dear all,

Good news--the EI article is now, finally, \*literally\* off to press. It should be appearing on the site soon. Will have to see how they arrange the cross-links w/ the interactive component on the NGDC site. Will keep you all posted,

mike

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Professor Michael E. Mann  
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---

e-mail: mann@virginia.edu Phone: (804) 924-7770 FAX: (804) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.html>

Subject: spring workshop

From: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>

Date: 11/6/00 10:17 AM

To: david@atmos.washington.edu, rbradley@geo.umass.edu, mcane@ldeo.columbia.edu, jcole@geo.arizona.edu, tom@ocean.tamu.edu, drdendro@ldeo.columbia.edu, hfd@cdc.noaa.gov, mevans@ldeo.columbia.edu, khughen@whoi.edu, mhughes@lrr.arizona.edu, jlean@ssd5.nrl.navy.mil, jto@u.arizona.edu, reichert@dkrz.de, rwebb@cdc.noaa.gov

CC: dverardo@nsf.gov, Mark.Eakin@noaa.gov, Connie.Woodhouse@noaa.gov, mann@virginia.edu

Dear all,

I wanted to informally alert you to a workshop

"Reconstructing Late Holocene Climate"

to be held in in Charlottesville, Va. 17-20 April 2000, which we hope you will be able to attend. The workshop will examine both modeling and empirical approaches to the problem of reconstructing climate over the past one-to-several millennia.

This is a PAGES/CLIVAR sanctioned workshop, and will be co-organized by myself and Hans von Storch of GKSS, involving approximately 40 total participants from the U.S. and Europe. Unfortunately, we are limited to about 15 participants from the U.S., and coming up w/ such a short list has been difficult.

Limited travel support should be available. Please confirm whether or not you expect to be able to attend, and let me know if you have any questions.

Futher details and an official invitation will follow in the future.

best regards,

mike mann

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Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

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e-mail: mann@virginia.edu Phone: (804) 924-7770 FAX: (804) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.html>

Subject: Ref

From: "Raymond S. Bradley" <rbradley@geo.umass.edu>

Date: 11/13/00 5:59 PM

To: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>, mhughes@ltrr.arizona.edu

FYI, I saw the Diaz/Markgraf new book in La Jolla earlier this week...it looks good. we will all eventually receive a copy. Meanwhile, the correct citation is:

Mann, M.E., R.S. Bradley, and M.K. Hughes, M.K., 2000a. Long-term variability in the El Niño Southern Oscillation and associated teleconnections. In: El Niño and the Southern Oscillation. Multiscale Variability and Global and Regional Impacts (eds. H.F. Diaz & V. Markgraf). Cambridge University Press, Cambridge, U.K. 357-412..

How should the Earth Interactions paper be cited?

ray

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Tel: 413-545-2120

Fax: 413-545-1200

Climate System Research Center: 413-545-0659

Climate System Research Center Web Page: <<http://www.geo.umass.edu/climate/climate.html>>

Paleoclimatology Book Web Site (1999): <http://www.geo.umass.edu/climate/paleo/html>

Subject: Re: EI article  
From: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>  
Date: 11/15/00 11:19 AM  
To: mhughes@ltrr.arizona.edu, rbradley@geo.umass.edu

> >X-Sender: jto@jto.inbox.email.arizona.edu  
> >Date: Wed, 15 Nov 2000 10:48:59 -0700  
> >To: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>  
> >From: Jonathan Overpeck <jto@u.arizona.edu>  
> >Subject: Re: EI article  
> >Cc: Mark Eakin <mark.eakin@noaa.gov>  
> >  
> >Cool! What about press release junk? I'm going to forward it to our  
> >press folks here, and also to Mark Eakin, since his team still has a  
> >bunch of key co-authors (and NOAA supported the effort). Good job,  
> >Cheers, Peck  
> >--  
> >Jonathan T. Overpeck  
> >Director, Institute for the Study of Planet Earth  
> >Professor, Department of Geosciences  
> >  
> >Mail and Fedex Address:  
> >  
> >Institute for the Study of Planet Earth  
> >715 N. Park Ave. 2nd Floor  
> >University of Arizona  
> >Tucson, AZ 85721  
> >direct tel: +1 520 622-9065  
> >fax: +1 520 792-8795  
> >[http://www.geo.arizona.edu/Faculty\\_Pages/Overpeck.J.html](http://www.geo.arizona.edu/Faculty_Pages/Overpeck.J.html)  
> ><http://www.ispe.arizona.edu/>  
> >  
> >

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Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

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e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (804) 924-7770 FAX: (804) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.html>

Subject: Re: EI article  
From: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>  
Date: 11/15/00 11:48 AM  
To: Jonathan Overpeck <jto@u.arizona.edu>  
CC: Mark Eakin <mark.eakin@noaa.gov>, mhughes@ltrr.arizona.edu, rbradley@geo.umass.edu, mann@virginia.edu

Hi Peck,

Thanks--I'll leave it to the others to decide if it merits additional press, etc.

But certainly, I think it would be great if NOAA Paleo could highlight the interactive version of the paper:

[http://www.ngdc.noaa.gov/paleo/ei/ei\\_cover.html](http://www.ngdc.noaa.gov/paleo/ei/ei_cover.html)

on the NOAA paleo main page...

mike

At 10:48 AM 11/15/00 -0700, Jonathan Overpeck wrote:

> >Cool! What about press release junk? I'm going to forward it to our  
> >press folks here, and also to Mark Eakin, since his team still has a  
> >bunch of key co-authors (and NOAA supported the effort). Good job,  
> >Cheers, Peck

> >--

> >Jonathan T. Overpeck  
> >Director, Institute for the Study of Planet Earth  
> >Professor, Department of Geosciences

> >

> >Mail and Fedex Address:

> >

> >Institute for the Study of Planet Earth

> >715 N. Park Ave. 2nd Floor

> >University of Arizona

> >Tucson, AZ 85721

> >direct tel: +1 520 622-9065

> >fax: +1 520 792-8795

> >[http://www.geo.arizona.edu/Faculty\\_Pages/Overpeck.J.html](http://www.geo.arizona.edu/Faculty_Pages/Overpeck.J.html)

> ><http://www.ispe.arizona.edu/>

> >

>

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Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

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e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (804) 924-7770 FAX: (804) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.html>

Attachments:

eint\_vol4\_0004\_1\_29\_2.pdf 1.5 MB

Subject: Re: EI article  
From: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>  
Date: 11/15/00 12:33 PM  
To: mark.eakin@noaa.gov  
CC: Jonathan Overpeck <jto@u.arizona.edu>, mhughes@ltrr.arizona.edu, rbradley@geo.umass.edu, mann@virginia.edu, ep@ngdc.noaa.gov

Hi Mark,

Sorry we didn't clarify. Indeed, the EI paper is finally to appear, due out on the EI website any day now. The pdf I sent you is the version that will appear on their site, but, as I understand, it, w/ a clear link to the "interactive" version on the NGDC site, which allows full access to the reconstructions, animations of the yearly patterns, etc.

The official reference is:

Mann, M.E., Gille, E., Bradley, R.S., Hughes, M.K., Overpeck, J.T., Keimig, F.T., Gross, W., Global Temperature Patterns in Past Centuries: An interactive presentation, Earth Interactions, 4-4, 1-29, 2000.

mike

At 12:14 PM 11/15/00 -0700, Mark Eakin wrote:

>>Publicity is something that we can definitely do. However, I missed the original  
>>message. Does this mean that the long awaited EI paper is officially coming out?

>>

>>Mark

>>

>>"Michael E. Mann" wrote:

>>

>>> Hi Peck,

>>>

>>> Thanks--I'll leave it to the others to decide if it merits additional

>>> press, etc.

>>>

>>> But certainly, I think it would be great if NOAA Paleo could highlight

>>> the interactive version of the paper:

>>>

>>> [http://www.ngdc.noaa.gov/paleo/ei/ei\\_cover.html](http://www.ngdc.noaa.gov/paleo/ei/ei_cover.html)

>>>

>>> on the NOAA paleo main page...

>>>

>>> mike

>>>

>>> At 10:48 AM 11/15/00 -0700, Jonathan Overpeck wrote:

>>>> >Cool! What about press release junk? I'm going to forward it to our

>>>> >press folks here, and also to Mark Eakin, since his team still has a

>>>> >bunch of key co-authors (and NOAA supported the effort). Good job,

>>>> >Cheers, Peck

>>>> >--

>>> >> >Jonathan T. Overpeck  
>>> >> >Director, Institute for the Study of Planet Earth  
>>> >> >Professor, Department of Geosciences  
>>> >> >  
>>> >> >Mail and Fedex Address:  
>>> >> >  
>>> >> >Institute for the Study of Planet Earth  
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>>> >> >Tucson, AZ 85721  
>>> >> >direct tel: +1 520 622-9065  
>>> >> >fax: +1 520 792-8795  
>>> >> >[http://www.geo.arizona.edu/Faculty\\_Pages/Overpeck.J.html](http://www.geo.arizona.edu/Faculty_Pages/Overpeck.J.html)  
>>> >> ><http://www.ispe.arizona.edu/>  
>>> >> >  
>>> >> >

>>> >> -----  
>>> >> Name: eint\_vol4\_0004\_1\_29\_2.pdf  
>>> >> eint\_vol4\_0004\_1\_29\_2.pdf Type: Portable Document Format  
(application/pdf)  
>>> >> Encoding: base64  
>>> >> Download Status: Not downloaded with message  
>>> >> -----

>>> >> -----  
>>> >> Professor Michael E. Mann  
>>> >> Department of Environmental Sciences, Clark Hall  
>>> >> University of Virginia  
>>> >> Charlottesville, VA 22903  
>>> >> -----  
>>> >> e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (804) 924-7770 FAX: (804) 982-2137  
>>> >> <http://www.evsc.virginia.edu/faculty/people/mann.html>  
>>> >> >

>>> >> >C. Mark Eakin, Ph.D.  
>>> >> >Chief of NOAA Paleoclimatology Program and  
>>> >> >Director of the World Data Center for Paleoclimatology  
>>> >> >  
>>> >> >NOAA/National Geophysical Data Center  
>>> >> >325 Broadway E/GC  
>>> >> >DSRC 1B139  
>>> >> >Boulder, CO 80305-3328  
>>> >> >Voice: 303-497-6172 Fax: 303-497-6513  
>>> >> >Internet: [mark.eakin@noaa.gov](mailto:mark.eakin@noaa.gov)  
>>> >> ><http://www.ngdc.noaa.gov/paleo/paleo.html>  
>>> >> >  
>>> >> >  
>>> >> >  
>>> >> >

---

Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall

University of Virginia  
Charlottesville, VA 22903

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e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (804) 924-7770 FAX: (804) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.html>

Subject: Virus alert  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 11/18/00 1:41 PM  
To: jeffrey.park@yale.edu  
CC: mhughes@ltrr.arizona.edu

> >From: mhughes@ltrr.arizona.edu  
> >X-Authentication-Warning: schulman.ltrr.arizona.edu: www set sender to  
mhughes@ltrr.arizona.edu using -f  
> >Date: Sat, 18 Nov 2000 11:11:00 -0700  
> >To: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>  
> >Subject: Virus alert  
> >User-Agent: IMP/PHP IMAP webmail program 2.2.0-pre10  
> >  
> >  
> >Dear Mike - late yesterday my machine got infected with a virus/worm/backdoor  
> >combination called W32/MTM@MM. It may have screwed both Windows and linux  
on my  
> >machine. Please 1) run a virus check on your machine; 2) keep the recent  
files I  
> >sent you about the proposal - prior work, statement of work. I may well  
lose my  
> >versions and have to start again. Please pass on this info to Jeff. I'm  
sending  
> >this by web e-mail from another machine, so you shouldn't have to worry about  
> >this message, Cheers, Malcolm  
> >  
> >  
> >

---

Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

---

e-mail: mann@virginia.edu Phone: (804) 924-7770 FAX: (804) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.html>

Subject: Fwd: BAMS  
From: "Raymond S. Bradley" <rbradley@geo.umass.edu>  
Date: 12/7/00 10:59 AM  
To: mhughes@ltrr.arizona.edu, mann@multiproxy.evsc.virginia.edu

i guess it's out, though i have not yet seen it. Herewith, praise indeed, (from somebody not normally given to enthusiasm...?!)

ray

> From: "Lean, Judith" <jlean@ssd5.nrl.navy.mil>  
> To: "Raymond S. Bradley" <rbradley@geo.umass.edu>  
> Subject: BAMS  
> Date: Thu, 7 Dec 2000 12:40:18 -0500  
> X-Mailer: Internet Mail Service (5.5.2650.21)  
>  
> Dear Ray, I thought your Commentary (with Malcolm and Mike) in December 2000  
> BAMS was truly excellent! INSPIRED! Good job! Judith

Raymond S. Bradley  
Professor and Head of Department  
Department of Geosciences  
University of Massachusetts  
Amherst, MA 01003-5820

Tel: 413-545-2120  
Fax: 413-545-1200

Climate System Research Center: 413-545-0659

Climate System Research Center Web Page: <<http://www.geo.umass.edu/climate/climate.html>>

Paleoclimatology Book Web Site (1999): <http://www.geo.umass.edu/climate/paleo/html>

Subject: amherst  
From: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>  
Date: 1/18/01 10:04 AM  
To: rbradley@geo.umass.edu, mhughes@ltrr.arizona.edu

Hi Ray, Malcolm:

Looks like I'll be in town in Amherst from Feb 8-12 (plus or minus a day), and was hoping this would be a chance for us to get together. Are you both going to be around? Let me know when you have the chance. Thanks,

mike

---

Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

---

e-mail: mann@virginia.edu Phone: (804) 924-7770 FAX: (804) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.html>

Subject: from Shanghai  
From: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>  
Date: 1/25/01 10:49 AM  
To: dverardo@nsf.gov, hzimmerm@nsf.gov, jto@u.arizona.edu, mark.eakin@noaa.gov, mmaccrac@usgcrp.gov, p.jones@uea.ac.uk, todd@ogp.noaa.gov, tom@ocean.tamu.edu  
CC: jng@virginia.edu, wfr5c@virginia.edu

Dear all,

I thought you might be interested in this, from today's BBC:

[http://news.bbc.co.uk/hi/english/sci/tech/newsid\\_1130000/1130501.stm](http://news.bbc.co.uk/hi/english/sci/tech/newsid_1130000/1130501.stm)

Not to slight Sir John(!), but its actually the chart in the background  
I'm referring to :)

cheers,

mike

---

Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

---

e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (804) 924-7770 FAX: (804) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.html>

Subject: Re: recognize the image in the background?  
From: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>  
Date: 1/25/01 10:17 AM  
To: mhughes@ltrr.arizona.edu  
CC: Ray Bradley <rbradley@geo.umass.edu>, mann@virginia.edu

Hey, that's Sir John you're talking about! And a fellow brit, no less!

I thought it was pretty cool too. I'd like to know what he was saying about the chart!

At 09:58 AM 1/25/01 -0700, mhughes@ltrr.arizona.edu wrote:  
> > Highly cool! - pity about the ugly old guy in front! CHeers, Malcolm  
> >  
> > Quoting "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>:  
> >  
>> >> [http://news.bbc.co.uk/hi/english/sci/tech/newsid\\_1130000/1130501.stm](http://news.bbc.co.uk/hi/english/sci/tech/newsid_1130000/1130501.stm)  
>> >>

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>> >> Professor Michael E. Mann  
>> >> Department of Environmental Sciences, Clark Hall  
>> >> University of Virginia  
>> >> Charlottesville, VA 22903

---

>> >> e-mail: mann@virginia.edu Phone: (804) 924-7770 FAX: (804) 982-2137  
>> >> <http://www.evsc.virginia.edu/faculty/people/mann.html>

>> >>  
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Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

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e-mail: mann@virginia.edu Phone: (804) 924-7770 FAX: (804) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.html>

Subject: Re: recognize the image in the background?  
From: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>  
Date: 1/25/01 10:17 AM  
To: mhughes@ltrr.arizona.edu  
CC: Ray Bradley <rbradley@geo.umass.edu>, mann@virginia.edu

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At 09:58 AM 1/25/01 -0700, mhughes@ltrr.arizona.edu wrote:  
> > Highly cool! - pity about the ugly old guy in front! CHeers, Malcolm  
> >  
> > Quoting "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>:  
> >  
>> >> [http://news.bbc.co.uk/hi/english/sci/tech/newsid\\_1130000/1130501.stm](http://news.bbc.co.uk/hi/english/sci/tech/newsid_1130000/1130501.stm)  
>> >>

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>> >> Professor Michael E. Mann  
>> >> Department of Environmental Sciences, Clark Hall  
>> >> University of Virginia  
>> >> Charlottesville, VA 22903

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>> >> e-mail: mann@virginia.edu Phone: (804) 924-7770 FAX: (804) 982-2137  
>> >> <http://www.evsc.virginia.edu/faculty/people/mann.html>  
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Charlottesville, VA 22903

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e-mail: mann@virginia.edu Phone: (804) 924-7770 FAX: (804) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.html>

Subject: recognize the image in the background?  
From: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>  
Date: 1/25/01 9:38 AM  
To: Ray Bradley <rbradley@geo.umass.edu>, mhughes@ltr.arizona.edu

[http://news.bbc.co.uk/hi/english/sci/tech/newsid\\_1130000/1130501.stm](http://news.bbc.co.uk/hi/english/sci/tech/newsid_1130000/1130501.stm)

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Charlottesville, VA 22903

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e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (804) 924-7770 FAX: (804) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.html>

Subject: Re: this just out  
From: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>  
Date: 3/1/01 8:06 AM  
To: "Raymond S. Bradley" <rbradley@geo.umass.edu>, p.jones@uea.ac.uk, mhughes@ltrr.arizona.edu

HI Ray,

Seen this. I told Rob there were problem with the comparison because he needed to subsample our reconstructions over a similar spatial domain, then he'd get a closer result. BUt I was encouraged that his method gives a somewhat more reasonable (closer to ours) result. than the Pollack et al analysis of the same data. He argues that his method is more reliable...

mike

At 09:54 AM 3/1/01 -0500, Raymond S. Bradley wrote:

> <http://www.agu.org/grl/articles/2000GL12348/GL11683W01.html>  
> Raymond S. Bradley  
> Professor and Head of Department  
> Department of Geosciences  
> University of Massachusetts  
> Amherst, MA 01003-5820  
>  
> Tel: 413-545-2120  
> Fax: 413-545-1200  
> Climate System Research Center: 413-545-0659  
> Climate System Research Center Web Page: <<http://www.geo.umass.edu/climate/climate.html>>  
> Paleoclimatology Book Web Site (1999): <http://www.geo.umass.edu/climate/paleo/html>  
>  
>  
>

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Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

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e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (804) 924-7770 FAX: (804) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.html>

Subject: this just out  
From: "Raymond S. Bradley" <rbradley@geo.umass.edu>  
Date: 3/1/01 7:54 AM  
To: mann@multiproxy.evsc.virginia.edu, p.jones@uea.ac.uk, mhughes@ltrr.arizona.edu

<http://www.agu.org/grl/articles/2000GL012348/GL11683W01.html>

Raymond S. Bradley  
Professor and Head of Department  
Department of Geosciences  
University of Massachusetts  
Amherst, MA 01003-5820

Tel: 413-545-2120

Fax: 413-545-1200

Climate System Research Center: 413-545-0659

Climate System Research Center Web Page: <<http://www.geo.umass.edu/climate/climate.html>>

Paleoclimatology Book Web Site (1999): <http://www.geo.umass.edu/climate/paleo/html>

Subject: Re: FULL REFERENCES FOR CHAPTER 2  
From: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>  
Date: 3/2/01 8:13 AM  
To: "Folland, Chris" <ckfolland@meto.gov.uk>  
CC: mhughes@ltrr.arizona.edu, mann@virginia.edu

Hi Chris,

By cc of this message to Malcolm Hughes I'm asking him if there is an update in the status of this manuscript:

16. Hughes, M.K., E.A. Vaganov, S. Shiyatov, R. Touchan and G. Funkhouser, 1999: Twentieth century summer warmth in northern Yakutia in a 600 year context. The Holocene, in press.

I have no updates for any of the others,

mike

At 12:35 PM 3/2/01 +0000, you wrote:

> Mike  
>  
> Have you a full reference for any of the items under list E in the attached  
> which you can readily help with:  
>  
> <<REFERENCES AT 28.2.01.rtf>>  
>  
> Note that item 2 is done, and item 3 has been deleted.  
>  
> If further complete references on this list come along in the next few  
> weeks, please send.  
>  
> Cheers  
>  
> Chris Folland  
> Met Office, Hadley Centre for Climate Prediction and Research, London Road,  
> Bracknell, Berkshire, RG12 2SY  
> email: ckfolland@meto.gov.uk  
> Tel: +44 (0)1344 856646  
> Fax: +44 (0)1344 854898  
> > <http://www.metoffice.gov.uk>  
> >  
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> >  
> >

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Charlottesville, VA 22903

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<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

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<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Attachments:

program-draft4pt02.doc 74.0 KB  
invite.doc 25.0 KB

Subject: Re: workshop  
From: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>  
Date: 4/6/01 9:01 AM  
To: "Malcolm K. Hughes" <mhughes@lrr.arizona.edu>  
CC: bwm6q@virginia.edu, [REDACTED]

At 08:50 AM 4/6/01 -0700, Malcolm K. Hughes wrote:

> Please send details to both [REDACTED] and this address, THanks, Malcolm

>  
> Quoting Michael Mann <memann00@hotmail.com>:

>  
>>  
>> Hi Brenda,

>> I've just heard from Malcolm Hughes. For some reason he apparently  
>> hasn't  
>> recieved any information at all about the workshop, including hotel  
>> inf.,  
>> etc. as well as the program.

>>  
>> This may be due to an email problem at the U.Arizona end which rejects  
>> emails from U.Virginia for some reason, although this has probably been  
>> fixed. I'm still a bit confused though as to why he didn't receive the  
>> hardcopy version of the invitation letter w/ hotel information, etc.  
>> which  
>> we mailed out.

>>  
>> In any case, can you please send him the information ASAP to his  
>> alternative email (cc'd above):

>> [REDACTED]  
>>  
>> Thanks in advance,

>>  
>> mike

>> 

---

  
>> Get your FREE download of MSN Explorer at <http://explorer.msn.com>

>>  
>>  
>>  
>> Professor Malcolm K. Hughes  
>> Laboratory of Tree-Ring Research  
>> W.Stadium 105  
>> University of Arizona  
>> Tucson, AZ 85721  
>> phone 520-621-6470  
>> fax 520-621-8229

---

Professor Michael E. Mann  
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University of Virginia  
Charlottesville, VA 22903

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e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (804) 924-7770 FAX: (804) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Attachments:

program-draft4pt02.doc 74.0 KB  
invite.doc 25.0 KB

Subject: Re: Workshop  
From: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>  
Date: 4/9/01 2:37 PM  
To: "Malcolm K. Hughes" <mhughes@ltrr.arizona.edu>

HI Malcolm,

Yes, there will be an LCD projector available which connects directly to a standard laptop...

mike

At 02:26 PM 4/9/01 -0700, you wrote:

> Dear Mike - will there be facilities for Powerpoint presentations? If so, for  
> what platforms? Cheers, Malcolm (please also reply to \_\_\_\_\_  
> Professor Malcolm K. Hughes  
> Laboratory of Tree-Ring Research  
> W.Stadium 105  
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Professor Michael E. Mann  
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e-mail: mann@virginia.edu Phone: (804) 924-7770 FAX: (804) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: Re: Some perspective

From: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>

Date: 4/15/01 10:30 AM

To: Chick Keller <ckeller@igpp.ucsd.edu>

CC: rbradley@geo.umass.edu, mhughes@ltrr.arizona.edu, mann@virginia.edu, tom crowley <tom@ocean.tamu.edu>

Hi Chick,

Unfortunately, you catch me just as I return from travel and am getting ready to host a week-long workshop, so can't respond to you in detail.

However, I think several of your questions are addressed in the publications i pointed out in the previous message I cc'd you. The issue of sensitivity of our reconstructions to possible loss of low-frequency information is addressed both in our '99 GRL article and, again, in our Earth Interactions (online) article (there is a link to it from my web page). I think this is largely a settled point now.

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So the point is that certain regions, like Europe, are likely to have experienced considerably enhanced anomalies relative to the more modest hemispheric mean trends. Undoubtedly, effects on ENSO, etc. further complicate the possible spatial structure of temperature variations. But neither the NAO or ENSO project much onto hemispheric or global annual mean temperature. At least, not during the instrumental era, and that is unlikely to have changed...

I hope that helps,

mike

At 10:50 AM 4/13/01 -0700, you wrote:

> ckeller@igpp.ucsd.edu

HI Michael,

Hope all is well with you. I'm doing fine here at Scripps immersed in things climate. After having read much of the literature on recent paleo-tempeatures (2,000 yrs ago to present), I am trying to write a summary. The summary is nearly finished but has several nagging problems that I thought I ask you about.

When I look at recent reconstructions of temperature over the past 1,000 yrs. I get a picture of a fairly low amplitude record which agrees on little warming in the period 1000-1200, but disagrees somewhat on how cold it got during the different so-called LIA episodes. Nevertheless, the picture is looking like total warming since the late 1600s till 1945 is about  $0.6 \pm 0.1$  °C, and temperatures in the period 1000-1200 don't exceed those in the middle of the 20th century.

So far so good.

Nagging problems with that:

There exist published records from around the world that suggest much larger amplitude variations (at least regionally) and temperatures 900-1200 equal to or higher than at present.

The standardization problem with tree rings/density points to loss of low frequency signal the longer back in time one looks. (which would lead to unrealistically low amplitude records).

GISPII delta O 18 record is flat but GRIP and Dye II borehole records are of very large amplitude (no land use problems on the Greenland Ice Cap so boreholes might be pretty good there?), which could say you shouldn't use GISP II as a temperature proxy for low frequency purposes.

Sargasso sea station S Keigwin) sediment record seems to corroborate GRIP and Dye borehole records of large amplitude warming centered on 1000.

Similar other large amplitude records exist from other sites around the world.

Thus, proxy records dominated by tree rings and GISP II give low amplitude, but one wonders how far you can push tree rings.

Now one argument is that when you average the large amplitude records, because they are not synchronous, the average amplitude is much reduced. But even then, the average would suggest an amplitude larger than from TR dominated reconstructions

So my questions:

Has subsequent work by you and colleagues answered any of these questions? Just how much can we rely on the latest standardization techniques to have preserved low frequency in tree ring?

In short, how comfortable are we that the low amplitude, not so warm MWP result is robust, and why?

Cheers,

Charles. "Chick" F. Keller,  
IGPP.SIO.UCSD - Attn: Chick Keller  
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La Jolla, CA 92093-0225  
(858) 822-1510 office  
(858) 534-2902 FAX  
[REDACTED] home

Is the noticeable increase in surfers off Scripps Beach a possible indication of global warming?

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Subject: Re: Some perspective  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 4/24/01 1:00 PM  
To: Chick Keller <ckeller@igpp.ucsd.edu>  
CC: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>, tom crowley <tom@ocean.tamu.edu>, p.jones@uea.ac.uk, rbradley@geo.umass.edu, k.briffa@uea.ac.uk, mhughes@ltr.arizona.edu

Hi Chick,

Unfortunately, I don't have time (no or in the foreseeable future) to address your specific question, though I'll assert that they have all been dealt w/ in the peer-reviewed literature by me or my various colleagues. I believe that Keigwin believes his evidence supports a strong NAO-like fluctuation in the North Atlantic in past centuries. It should strike people that the Sargasso Sea record looks nothing like n. hem mean temperature during the 19th and 20th century. Of course, why should it? If Keigwin is right, and there is a strong NAO overprint in past centuries, then any hemisphere-mean signal in precip, temperature, or circulation indicator throughout the North Atlantic basin would be completely overprinted by the NAO and essentially irrelevant to determining hemisphere mean temperature. You might refer to Hurrell's work in this area. The correlation between the NAO and annual-mean, full Northern hemisphere mean temperature is about 0.2 or so. Based on discussing this w/ Keigwin, I think my and his interpretation are consistent. Have you discussed this with him? You might want to get in touch w/ him yourself if you have further questions about his work.

Other than that, I've referred your comments to other people who you might want to consult w/ on this...

best of luck w/ your pursuits. Unfortunately, I have to sign off from the discussion at this point,

mike

At 12:35 PM 4/24/01 -0700, Chick Keller wrote:

> Hi Michael,

>

> Take your time answering this as your schedule sounds really busy, but you write, "I hope this answers your questions". It helps but it doesn't. There are just too many exceptions and conundrums to say the issue is closed.

>

> I have read carefully all the papers you mentioned and more, and have been plowing thru Ray Bradley's book Paleoclimatology (wonder why he never mentions borehole methods??). The problem with tree ring "standardization" is dealt with in some detail in various Briffa publications, most recently in Briffa et al, Feb 2001, JGR also, Briffa, Annual climate variability in the Holocene: interpreting the message of ancient trees, Quaternary Sci. Rev, 19, 87-105, 2000 see figure 5), and Briffa et al, Trees tell of past climates, Phil. Trans. R. Soc. Lond. 353, 67, 1998, Figs 2&3. Using Age Band Decomposition they show that how you do the standardization makes a big difference. So my first question--how does your 1999 reconstruction compare with the ABD method (can't find a discussion of this in either of your papers)?

>

> Second, I am fully aware of Keigwin's later paper and have discussed the pair on email with him. While he makes an interesting point about NAO connections to explain the differences between the Labrador and Sargasso records (very different proxies here), if I understood his paper, he is saying that the Labrador fan data is an anomalous result of local NOA-driven changes in the surface current that make it appear there is warming when the larger region is cooling. If that's what he's saying, it means we can ignore the Labrador fan in temperature reconstructions because it's not a real temperature change, just a minor redirection of a current.

> Consider that the Sargasso record agrees very well with the GRIP/Dye 3 borehole temperatures in showing a broad, multi-century warming centered around the year 1000 followed by a drop to cooler (LIA) temperature. This is consistent with the fact that temperature variations from Greenland (there's something wrong with the GISP II isotope record which shows little or no low frequency signal at all) saw temperature variations similar to those in the Sargasso Sea region regardless of what the foraminifera were doing off Labrador. And so I was asking what people are thinking

about the Greenland borehole inversions since there obviously is no "land use changes" effect there.

>

> "Summer only" reconstructions show significantly cooler hemispheric temperatures in the time interval 1550-1700 as well as slightly higher temperatures around 1100.

>

> Finally, I read recently that the expected cooling from Milankovitch cycles is about  $0.4^{\circ}$ /millenium right now. But that's greater than the cooling you show, part of which must be due to solar activity decreases and volcanoes. So that also appears to be a problem. (I did a not-unreasonable BoE calculation including estimates of temperature change due to solar activity changes, volcanic effects, etc, and get that the warming around 1000 was about the same as in the 1940-50 peak.)

>

> Bottom line. I'm impressed with how extensive and carefully done your work is, but it seems to be missing some low frequency features.

> Just a personal observation -- Whenever I see a series of multi-proxy plots I can almost always pick out the tree ring ones. They're the ones with little or no low frequency variation, just low amplitude, high frequency variation.

Hmmmm.

>

> In your Earth Interactions web stuff, you show your reconstruction (Fig 4) back to 1750 with and without tree rings. Do you have such a graph back to 1000, or are there too few non-tree rings records to make that comparison?

>

> Regardless, consider a disturbing statement from Briffa's Quat. Sci rev, p. 94, 2000: "it was not possible....to employ statistical techniques that preserve potential long-timescale climate variability for the large majority of locations (400 cool and moist sites, circum hemispheric)..... they represent timescales of growth variability up to centennial, but for most sites, not longer."

> In another publication he describes the RCS method (not the same as his ABD method) of standardization and says that it helps the problem, but "The RCS method potentially provides much more information on century-to-century time-scale changes in temperatures than the previous approach, but the lack of very long temperature data means that it is simply not possible to verify this centennial time-scale information without reference to other evidence." ( Briffa et al, Trees tell of past climates, Phil. Trans. R. Soc. Lond. 353, 67, 1998)

>

> Also, in that same article he shows three records from Canadian Rockies, North Sweden, and the Urals all back at least 1,000 yrs. They don't generally agree, but they all show amplitude variations as large or larger than in the 20th century and all have peak to peak (50 year filters) amplitude of a degree C or more! (This raises an entire set of questions of how regional variations could persist for greater than 50 years yet be so different.)

>

> Crowley and Lowry do a reasonable job of combining multi-proxy records, and show it warmer 1000-1300 and cooler 1600-1800. But Tom told me he didn't use absolute amplitudes in his reconstruction but normalized all the records to one amplitude. I guess I don't understand how he did that or how Jones and Briffa, in their Tenerife Paper (ESA SP-463 Dec 2000) converted the results into temperature, but it sounds like this approach could also reduce total amplitude (for example they include the Keigwin Sargasso record but apparently greatly reduce its amplitude by normalization.

>

> The nagging point here is that there exist a non-negligible number of published proxy records that show temperature amplitudes much larger than those dominated by tree rings. It would be an important contribution, having shown the reconstructions you and others have, to drop the other shoe as it were and discuss why these other records individually (a) aren't trustworthy, or (b) are fine but were not included (here merely saying that they aren't high enough resolution is insufficient since what people are taking from your results is the low frequency result, or (c) aren't relevant. Without such a discussion people like Wally Broecker can say with relative impunity that only "elevation of mountain snowlines and borehole records are accurate over centuries to  $0.5^{\circ}$ C.

>

> I guess while you may not be the person to do it. I'd love to see a 1000 yr temperature reconstruction from a large variety of records exclusive of tree rings, accompanied by a discussion of the accompanying estimated uncertainties.

>

> Let me list a few examples of what I'm seeing in the literature.

>

> Bradley in his Quat. Sci. Rev (2000) article shows two interesting records,

> (1) Fig 6c, Oxy isotope records in calcite (stalagmite from cave Mo i Rana in northern Norway--Lauritzen and Lundberg,1998

>                                   delta T (last thousand years = 2.0°C

> (2) Figs 6b & 7, Treeline changes northern Ural Mtns. show temperatures 1000-1300 were as high or higher than at present, and much colder 1550-1900.

>                                   delta T (last thousand years ~ 0.5°C

>

> West African SST (deMenocal, et al, Science, 288, 2198-2202, 2000) faunal record of SST (20°N, 18°W)--two coolings ~1300 and 1600 with substantial warming between                                   delta T (last thousand years ~4.0°C

>

> GRIP and Dye 3 bore hole reconstructions show broad warming centered near 1000 and two major coolings 1500 and 1900

>                                   delta T (last thousand years ~1.5°C

>

> Regards,

>

> Chick

>

>

>

>

>

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>>

>> mike

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>> Charles. "Chick" F. Keller,  
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>> (858) 822-1510 office  
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>> \_\_\_\_\_ home  
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Subject: [http://news.bbc.co.uk/hi/english/sci/tech/newsid\\_1298000/129856\\_2.stm](http://news.bbc.co.uk/hi/english/sci/tech/newsid_1298000/129856_2.stm)  
From: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>  
Date: 4/27/01 7:40 AM  
To: "Malcolm K. Hughes" <mhughes@ltrr.arizona.edu>, ckeller@igpp.ucsd.edu  
CC: tom@ocean.tamu.edu, p.jones@uea.ac.uk, rbradley@geo.umass.edu, k.briffa@uea.ac.uk, mann@virginia.edu

[http://news.bbc.co.uk/hi/english/sci/tech/newsid\\_1298000/1298562.stm](http://news.bbc.co.uk/hi/english/sci/tech/newsid_1298000/1298562.stm)

By BBC News Online's environment  
correspondent Alex Kirby

UK scientists say a thousand years' climate records show the last three decades were the millennium's warmest.

They also conclude that natural phenomena like El Nino are unlikely to have caused the unprecedented recent warming.

Their findings strengthen the argument that climate change is not produced by natural causes alone.

The scientists are Professor Phil Jones, Dr Tim Osborn, and Dr Keith Briffa, all from the Climatic Research Unit at the University of East Anglia. They report their work in the journal Science.

Their analysis included instrumental and documentary records, and also other "proxies" of past climate variability - evidence from tree rings, corals and ice cores.

Warmest century

For the northern hemisphere, their temperature reconstructions show that "the recent 30-year period is likely to have been the warmest (about 0.2 degrees Celsius above the 1961 to 1990 average) of the millennium, with the warmest century (by about 0.1 degrees C) likely to have been the 20th".

The authors say the first half of the millennium was milder than the 1500 to 1900 period. The coolest century was the 17th., followed by the 19th., with a milder interval between.

They add that their work provides some support for the idea that there were two epochs in the last millennium, the medieval warm period, spanning roughly 900 to 1200, and the little ice age from about 1550 to 1900.

The authors say: "The southern hemisphere temperature reconstructions are shorter and less reliable; they do indicate cooler conditions before 1900, but not the same inter-centennial variation evident in the north.

"The average shows greater recent warming than earlier in the 20th century, and there is no evidence of the slight 1945 to 1975 cooling seen over many northern hemisphere land areas.

"Instrumental data from Antarctica show a temperature rise until the early 1970s, with little change since then."

Greatest warming

Professor Jones said: "The accuracy of records for the first half of the millennium is sometimes queried. We have calculated errors, and the picture is clearer. All records show that the 20th century experienced the greatest warming of the millennium.

"Examining this broad span of records from all parts of the world, we see that the North Atlantic Oscillation, which is responsible for the UK's recent milder, wetter winters, has behaved in this unusual way before, notably in the 1730s, the mid-19th century, and the early 1900s.

"Similarly, we find elevated activity of El Nino events in some earlier periods. Some people have attributed global warming to these two phenomena. But the records show that their past activity did not result in significant warming."

No freeze

The scientists say it is important to recognise the dangers of taking documentary sources at face value.

They say accounts of the Thames freezing over in the past are often cited as proof that winters were colder then. But they say a significant factor in the freezing of the river was the way the old London Bridge was built with a number of piers, encouraging a process known as "ponding". In the winter of 1962/63, the third coldest since 1659, the river did not freeze at all.

There has been no complete freezing since the bridge was rebuilt to a different pattern between 1825 and 1835.

Professor Jones told BBC News Online: "Our work is part of the jigsaw, narrowing down the range of possible past climates. It shows that it is more likely that the underlying trend in global warming is the result of human influence."

At 01:16 PM 4/26/01 -0700, Malcolm K. Hughes wrote:

> Dear Chick - some thoughts on a couple of the points you raised, Cheers, Malcolm

> 1. There is no reference to the ABD in MBH 98 and 99 because the technique  
> was not available at that time - see the dates on Keith's publications that  
> describe it.

> 2. There are significant regions where the ABD method is not needed,  
> because the trees live much longer than those in the Schweingruber network that  
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> standardization necessary. There is a growing body of evidence that these  
> tree-ring records can capture century-to-millennial change accurately (Hughes  
> and Graumlich, 1996 and Hughes and Funkhouser 1998, for example). In fact, the  
> MBH reconstruction before AD 1400 was largely based on these.

> 3. Keith has pooled information from extremely large regions (presumably to  
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> spatial variability, ruling out the use of ABD.

> 4. The ABD method is new, needs testing, and, I predict, will be modified  
> as it is tested.

> 5. The benefit of annual resolution is that direct calibration and  
> cross-validation against instrumental records is possible with a high degree of  
> rigor. We are relaxing this condition somewhat in our ongoing analyses, and it  
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> Professor Malcolm K. Hughes  
> Laboratory of Tree-Ring Research  
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Subject: Re:

From: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>

Date: 4/27/01 7:32 AM

To: "Malcolm K. Hughes" <mhughes@lrr.arizona.edu>, ckeller@igpp.ucsd.edu

CC: tom@ocean.tamu.edu, p.jones@uea.ac.uk, rbradley@geo.umass.edu, k.briffa@uea.ac.uk, mann@virginia.edu

Well said Malcolm...

mike

p.s. Chick: You might want to check out the review article by Jones et al in the latest Science...

At 01:16 PM 4/26/01 -0700, Malcolm K. Hughes wrote:

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Subject: Re: land surface  
From: tom crowley <tom@ocean.tamu.edu>  
Date: 4/27/01 1:00 PM  
To: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>  
CC: tom crowley <tom@ocean.tamu.edu>, Ray Bradley <rbradley@geo.umass.edu>, mhughes@ltrr.arizona.edu, Jonathan Overpeck <jto@u.arizona.edu>, mann@virginia.edu

Mike et al,

although land feedback may play a role I remain skeptical of the magnitude of the simulated response. When we did a "realistic" vegetation reconstruction for the glacial maximum and compared it to the run with the modern case, total land temperature changes were about 0.5 C, and these vegetation changes were HUGE. True, we prescribed SST but anytime someone starts invoking a vegetation feedback that changes sst I get more than a little uncomfortable.

I have not seen the paper but it seems that the authors are going too far that their result provides a counterexplanation to volcanism and solar to explaining the cooling trend - there is NO WAY I would believe their ability to simulate the multidecadal oscillations with a degree of similarity we are seeing with the solar and volcano records, and after we remove the external forcing trends there is little remaining residual trend to explain. The externally forced explanation must be evaluated first and only then can the more uncertain time series of vegetation changes be considered.

with respect to the effects of vegetation on the 19th century model-data differences I discuss, most of the clearing in eastern North America was post Civil War - say 1870-1910. that is precisely when our model-data differences are the largest - hemispheric data are colder than the model. But an examination of real data (Jones) indicates that eastern North America was warming over that time, not cooling as would be suggested from a deforestation model. That warming was probably due to a positive phase of the NAO, which we cannot expect any model to simulate correctly with respect to a particular time interval. To retain vegetation as the ultimate explanation would require invoking some vegetation feedback on the NAO that involves some increasingly precarious reasoning.

thus although I believe it is important to consider vegetation I remain unconvinced that it critically closes some important unexplained gaps between models and observations.

Tom

> >Dear All,  
> >  
> >Thought you'd be interested in the latest coming out of the LLNL group,  
> >apropos to the discussions we had in Charlottesville...  
> >  
> >mike

> >

> >

> >

---

Professor Michael E. Mann

> >

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> >

University of Virginia

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> >

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> >

> >Attachment converted: Macintosh HD:llnl-rpp042301.txt (TEXT/MSIE) (0002ADFA)

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Texas A&M University

College Station, TX 77843-3146

979-845-0795

979-847-8879 (fax)

979-845-6331 (alternate fax)

Subject: bush & cc  
From: "Raymond S. Bradley" <rbradley@geo.umass.edu>  
Date: 4/28/01 10:32 AM  
To: mhughes@ltrr.arizona.edu, mann@multiproxy.evsc.virginia.edu, frank@geo.umass.edu

<http://www.nytimes.com/2001/04/28/politics/28CLIM.html>

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Paleoclimatology Book Web Site (1999): <http://www.geo.umass.edu/climate/paleo/html>

Subject: Re: MAy 19-21  
From: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>  
Date: 4/29/01 11:50 AM  
To: "Raymond S. Bradley" <rbradley@geo.umass.edu>, Malcolm Hughes <mhughes@ltrr.arizona.edu>  
CC: srutherford@virginia.edu, mann@virginia.edu

Dear Ray and Malcolm,

I too will be cutting it a bit close, returning from Marblehead late sunday evening. But if plan to meet in the late morning through mid-afternoon, that sounds like the best compromise. By cc of this to Scott, I'm seeing if he'll be able to make it up at that time too. Scott?

off to seattle now,

mike

At 01:28 PM 4/28/01 -0400, Raymond S. Bradley wrote:

> I get back May 20th @ 11.56pm....I guess i'll be quite tired the next day, but am willing/happy to meet you & Mike if you'all think that will work.

>

> ray

>

> At 10:42 AM 4/28/01 -0700, you wrote:

>> Any word? Cheers, Malcolm

>> Malcolm Hughes

>> Professor of Dendrochronology

>> Laboratory of Tree-Ring Research

>> University of Arizona

>> Tucson, AZ 85721

>> 520-621-6470

>> fax 520-621-8229

>

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>

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<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: Re: MAy 19-21  
From: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>  
Date: 4/29/01 12:45 PM  
To: "Malcolm K. Hughes" <mhughes@ltrr.arizona.edu>  
CC: "Raymond S. Bradley" <rbradley@geo.umass.edu>, Malcolm Hughes <mhughes@ltrr.arizona.edu>, srutherford@virginia.edu

Hi Malcolm,

The only problem is that I'm not yet sure whether I'll return from Marblehead sunday night or monday morning. If the latter, the morning might be problematic, though late morning would probably be doable. Will let you know as soon as I can be more specific...

mike

At 12:13 PM 4/29/01 -0700, Malcolm K. Hughes wrote:

> How about making it Tuesday morning? Cheers, Malcolm

>

> Quoting "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>:

>

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>>

>> mike

>>

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>> day,

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Subject: Re: MAy 19-21  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 4/29/01 3:14 PM  
To: "Malcolm K. Hughes" <mhughes@lrr.arizona.edu>  
CC: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>, rbradley@geo.umass.edu, srutherford@virginia.edu

oops. Ok, yes that would work great...

mike

At 03:05 PM 4/29/01 -0700, Malcolm K. Hughes wrote:

> Mike - note - I'm suggesting Tuesday morning rather than Monday morning, Cheers,

> Malcolm

> Quoting "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>:

>

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> > fax 520-621-8229

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<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: Re: MAy 19-21  
From: "Raymond S. Bradley" <rbradley@geo.umass.edu>  
Date: 4/29/01 4:54 PM  
To: mhughes@ltrr.arizona.edu, "Michael E. Mann" <mann@virginia.edu>

obviously, that suits me better too. And you can stay with me Monday & tuesday, Malcolm, if you want  
ray

At 06:14 PM 4/29/01 -0400, you wrote:

> oops. Ok, yes that would work great...

>

> mike

>

> At 03:05 PM 4/29/01 -0700, Malcolm K. Hughes wrote:

>> Mike - note - I'm suggesting Tuesday morning rather than Monday morning, Cheers,

>> Malcolm

>> Quoting "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>:

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>>> >Quoting "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>:

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Paleoclimatology Book Web Site (1999): <http://www.geo.umass.edu/climate/paleo/html>

Subject: Re: MAy 19-21  
From: Scott Rutherford <srutherford@virginia.edu>  
Date: 4/30/01 6:03 AM  
To: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>, "Malcolm K. Hughes" <mhughes@ltr.arizona.edu>  
CC: "Raymond S. Bradley" <rbradley@geo.umass.edu>, srutherford@virginia.edu

I can make either Monday or Tuesday.

-Scott

--

---

Scott Rutherford

University of Virginia    University of Rhode Island  
Environmental Sciences    Graduate School of Oceanography  
Clark Hall                South Ferry Road  
Charlottesville, VA 22903    Narragansett, RI 02882  
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fax: (804) 982-2137    (401) 874-6160

Subject: Fwd: McCain critical of global warming - 5/2/2001 - ENN.com  
From: "Raymond S. Bradley" <rbradley@geo.umass.edu>  
Date: 5/2/01 10:56 AM  
To: mann@multiproxy.evsc.virginia.edu, mhughes@ltrr.arizona.edu

Into each life, a little sunshine falls....

> Date: Wed, 02 May 2001 13:46:36 -0400  
> From: Frank Keimig <frank@geo.umass.edu>  
> X-Mailer: Mozilla 4.73 [en] (Win98; U)  
> X-Accept-Language: en,pdf  
> To: "Raymond S. Bradley" <rbradley@geo.umass.edu>  
> Subject: McCain critical of global warming - 5/2/2001 - ENN.com  
>  
>  
> [http://www.enn.com/news/wire-stories/2001/05/05022001/ap\\_mccain\\_43337.asp?s\\_ite=email](http://www.enn.com/news/wire-stories/2001/05/05022001/ap_mccain_43337.asp?s_ite=email)  
>  
> --  
> Frank Keimig  
> Department of Geosciences  
> University of Massachusetts  
> Amherst, MA 01003  
> 413-545-0659  
> Fax: 413-545-1200  
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> McCain critical of global warming  
>  
> Wednesday, May 2, 2001  
> By Associated Press  
>  
> Sen. John McCain criticized the Bush administration Tuesday for scrapping rather than trying to fix the 1997 Kyoto  
climate treaty and its mandatory pollution reductions to curb heat-trapping greenhouse emissions.  
>  
> "I wouldn't have done that," the Arizona Republican and former presidential contender, said in an interview. "I don't  
agree with everything in the Kyoto Protocol but I think it is a framework we could have continued to work with. We  
could have fixed it."  
>  
> The treaty, negotiated in Kyoto, Japan, calls on industrial nations to cut heat-trapping emissions to below 1990  
levels by 2012. President Bush sparked an international outcry when he said on March 28 that it was unworkable and  
discriminates against the United States.  
>  
> Bush said he would not submit it to the Senate for ratification.  
>  
> Negotiators in Kyoto had specified that major industrialized countries which are the worst polluters should be  
assigned most of the emission cutbacks. Instead, Bush said, developing nations must be included in any mandatory  
cuts on carbon dioxide emissions.

>  
> At a hearing Tuesday before the Senate Commerce Committee that McCain chairs, James E. Hansen, head of NASA's Goddard Institute for Space Studies, somewhat bolstered Bush's contention that regulating carbon dioxide emissions from power plants is unworkable at present.  
>  
> "It is impractical to stop carbon dioxide from increasing in the near term, as fossil fuels are the engine of the global economy," Hansen said. "However ... further reduction to constant emissions is feasible, especially since countries such as the United States have made only modest efforts at conservation."  
>  
> McCain said there is plenty of evidence of climate change due to recent human activity and the United States should help protect developing countries who face greater risks of loss of life and deprivation.  
>  
> "The developed countries, like the United States, must do its share in addressing this global problem," he said, citing a United Nations report that found some emissions reductions may produce net economic gains for developed countries.  
>  
> "This sounds like the basis for action to me," McCain said.  
>  
> But Sen. Chuck Hagel, R-Neb., described the results of work done by the U.N. Intergovernmental Panel on Climate Change as "political documents" written by "U.N. environmental activists."  
>  
> "When President Bush said the Kyoto Protocol was dead, he was merely stating the obvious," Hagel said.  
>  
> He added that the United States needs "to demonstrate a commitment to act domestically before it will be able to build international support for action absent the Kyoto Protocol."  
>  
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> Toolbox  
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>  
> <[http://www.enn.com/news/wire-stories/2\\_001/05/05022001/ap\\_mccain\\_43337.asp?site=email/javascript:popup2\('/extras/email-to-friend.asp?storyid=43337','email',675,400\)>E-mail this story to a friend](http://www.enn.com/news/wire-stories/2_001/05/05022001/ap_mccain_43337.asp?site=email/javascript:popup2('/extras/email-to-friend.asp?storyid=43337','email',675,400)>E-mail this story to a friend)>  
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>  
> <[http://www.enn.com/news/wire-stories/2\\_001/05/05022001/ap\\_mccain\\_43337.asp?site=email/index.asp](http://www.enn.com/news/wire-stories/2_001/05/05022001/ap_mccain_43337.asp?site=email/index.asp)>Home |

<[http://www.enn.com/news/wire-stories/2\\_001/05/05022001/ap\\_mccain\\_43337.asp?site=email/news/index.asp](http://www.enn.com/news/wire-stories/2_001/05/05022001/ap_mccain_43337.asp?site=email/news/index.asp)>News | <[http://www.enn.com/news/wire-stories/2\\_001/05/05022001/ap\\_mccain\\_43337.asp?site=email/indepth/index.asp](http://www.enn.com/news/wire-stories/2_001/05/05022001/ap_mccain_43337.asp?site=email/indepth/index.asp)>In-Depth | <[http://www.enn.com/news/wire-stories/2\\_001/05/05022001/ap\\_mccain\\_43337.asp?site=email/interact/index.asp](http://www.enn.com/news/wire-stories/2_001/05/05022001/ap_mccain_43337.asp?site=email/interact/index.asp)>Interact | <[http://www.enn.com/news/wire-stories/2\\_001/05/05022001/ap\\_mccain\\_43337.asp?site=email/marketplace/index.asp](http://www.enn.com/news/wire-stories/2_001/05/05022001/ap_mccain_43337.asp?site=email/marketplace/index.asp)>Marketplace | <[http://www.enn.com/news/wire-stories/2\\_001/05/05022001/ap\\_mccain\\_43337.asp?site=email/aboutenn/](http://www.enn.com/news/wire-stories/2_001/05/05022001/ap_mccain_43337.asp?site=email/aboutenn/)>About ENN | <[http://www.enn.com/news/wire-stories/2\\_001/05/05022001/ap\\_mccain\\_43337.asp?site=email/aboutenn/products.asp](http://www.enn.com/news/wire-stories/2_001/05/05022001/ap_mccain_43337.asp?site=email/aboutenn/products.asp)>Affiliate Tech Center | <[http://www.enn.com/news/wire-stories/2\\_001/05/05022001/ap\\_mccain\\_43337.asp?site=email/aboutenn/survey.asp](http://www.enn.com/news/wire-stories/2_001/05/05022001/ap_mccain_43337.asp?site=email/aboutenn/survey.asp)>Take Our Survey | <[http://www.enn.com/news/wire-stories/2\\_001/05/05022001/ap\\_mccain\\_43337.asp?site=email/aboutenn/feedback.asp](http://www.enn.com/news/wire-stories/2_001/05/05022001/ap_mccain_43337.asp?site=email/aboutenn/feedback.asp)>Feedback | <[http://www.enn.com/news/wire-stories/2\\_001/05/05022001/ap\\_mccain\\_43337.asp?site=email/aboutenn/sitemap.asp](http://www.enn.com/news/wire-stories/2_001/05/05022001/ap_mccain_43337.asp?site=email/aboutenn/sitemap.asp)>Site Map  
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Paleoclimatology Book Web Site (1999): <http://www.geo.umass.edu/climate/paleo/html>

Subject: letter to Science Magazine

From: "Raymond S. Bradley" <rbradley@geo.umass.edu>

Date: 5/8/01 4:13 PM

To: mann@multiproxy.evsc.virginia.edu, mhughes@ltrr.arizona.edu, k.briffa@uea.ac.uk, tom@ocean.tamu.edu, p.jones@uea.ac.uk

> We plan to print your letter in our issue of 25 May, but occasionally we must adjust our schedule, so there is a possibility it may appear in a later issue.

>

> Best regards,

> Charlene King

Raymond S. Bradley  
Professor and Head of Department  
Department of Geosciences  
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Tel: 413-545-2120

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Paleoclimatology Book Web Site (1999): <http://www.geo.umass.edu/climate/paleo/html>

Subject: Sheppard 4 corners drought  
From: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>  
Date: 5/8/01 1:04 PM  
To: mhughes@ltrr.arizona.edu  
CC: mann@virginia.edu

HI Ed,

A student in my course did a project on the Anasazi and 4 corners drought, and relied heavily on a dendro reconstruction which he attributes to Sheppard of your department. It seems to time well w/ the actual collapse, which sounds like its in conflict w/ what I recall from your own look at the problem. The student didn't provide a citation of anything that is peer-reviewed.

Let me know if you have any more info on this. Thanks,

mike

---

Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

---

e-mail: mann@virginia.edu Phone: (804) 924-7770 FAX: (804) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: re: Amherst  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 5/17/01 2:19 PM  
To: "Malcolm K. Hughes" <mhughes@ltrr.arizona.edu>  
CC: Scott Rutherford <srutherford@virginia.edu>, rbradley@geo.umass.edu, mann@virginia.edu

hi malcolm,

thanks--actually, i realize there may have been miscommunication anyways. I leave amherst \*on\* tuesday morning, so this is much better! So monday morning, around 11 am, perhaps meet at Raos. Ray, Scott?

mike

At 11:38 AM 5/17/01 -0700, you wrote:

> Dear Mike - as you will recall, we are scheduled to meet with Scott and Ray in  
> Amherst on Tuesday morning. As it turned out, Ray had flu and so did not go to  
> China this week. Therefore, so far as he is concerned, we could equally well  
> meet on Monday. If this would work for you and Scott (perhaps starting at 11 or  
> 12) it would be really helpful for me, because I could probably get home a day  
> earlier, and, as always, I am horribly overcommitted. What do you think? Cheers,  
> Malcolm

---

Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

---

e-mail: mann@virginia.edu Phone: (804) 924-7770 FAX: (804) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: Fwd: Recent Paper from the Competitive Enterprise Institute

From: "Michael E. Mann" <mann@virginia.edu>

Date: 5/24/01 10:15 AM

To: rbradley@geo.umass.edu, tkarl@ncdc.noaa.gov, tom crowley <tom@ocean.tamu.edu>, mhughes@ltrr.arizona.edu, jto@u.arizona.edu, rbradley@geo.umass.edu, p.jones@uea.ac.uk, k.briffa@uea.ac.uk, "Folland, Chris" <ckfolland@meto.gov.uk>, trenbert@cgd.ucar.edu, mann@virginia.edu

FYI. I received this from a colleague. This gives you some idea of who is behind this latest disinformation push.

A note to all regarding the Broecker piece, which has been heavily referred to in this and other similar recent pieces (though it is an opinion piece, and not peer-reviewed).

A response by Bradley, Briffa, Crowley, Hughes, Jones, and Mann appears in tomorrows issue of "Science". This response simply points out that old fallacies that are simply reiterated in Broecker's piece...

mike

> COMPETITIVE ENTERPRISE INSTITUTE

> Advancing the principles of free enterprise and  
> limited government

> 5/16/01

> Latest Global Warming Report Already Obsolete

> By Paul J. Georgia

> The United Nations Intergovernmental Panel on Climate Change  
> (IPCC) is  
> conducting a campaign of fear to convince us that energy  
> suppression is  
> our only salvation. The "Summary for Policymakers" of the  
> group's latest  
> report ? the report itself has not been officially released ?  
> paints a horrific  
> picture of a climate system gone mad.

> The new report, known as the "Third Assessment Report" (TAR),  
> is  
> expected to be the focal point for policymakers for the next  
> five years as  
> they decide what to do about global warming, just as the 1995  
> Second  
> Assessment Report has guided policymakers for the last five  
> years.

> Indeed, the bureaucrats driving the global warming process  
> are using the  
> IPCC to justify their anti-energy policies. Klaus Toepfer,  
> executive  
> director of the United Nations Environment Programme, said,  
> "The  
> scientific consensus presented in this comprehensive report  
> about  
> human induced climate change should sound alarm bells in  
> every  
> national capital and in every local community." [1]  
>  
> In the midst of this campaign, however, the science continues  
> to move  
> apace, leaving many of the IPCC's underlying assumptions and  
> subsequent conclusions in shambles. A sampling of scientific  
> studies  
> published after the completion of the final drafts of the TAR  
> is presented  
> here to give the reader a taste of the constant flux of  
> scientific inquiry and  
> our rapidly changing understanding of the climate system.  
> Indeed, if  
> recent studies are correct there would be little  
> justification for Kyoto-style  
> policies that would ultimately impede humanity's ability to  
> provide itself  
> with the wealth- and health-enhancing benefits of modern  
> civilization.  
>  
> Water Vapor Feedback. The biggest uncertainty in climate  
> science  
> remains "feedback" effects on the climate. The conventional  
> explanation  
> by proponents of global warming theory always assumes that  
> human-induced increases in atmospheric concentrations of  
> greenhouse  
> gases, primarily carbon dioxide, could lead to catastrophic  
> warming of  
> the planet. Man-made greenhouse gas emissions, however, are  
> only an  
> indirect cause of the forecasted warming. A doubling of  
> carbon dioxide  
> concentrations alone would lead to slight warming of about  
> one degree  
> Celsius (1.8 degrees Fahrenheit) over the next 100 years.  
> This small  
> amount of warming, according to standard global warming  
> theory, speeds  
> up evaporation, thereby increasing the amount of water vapor  
> (a major  
> greenhouse gas) in the atmosphere. This "positive water  
> vapor feedback"  
> effect is where most of the predicted warming comes from.

> This  
> assumption has never been tested.  
>  
> A recent study in the Bulletin of the American Meteorological  
> Society  
> suggests that the reverse is true.[2] The authors find a  
> negative water  
> vapor feedback effect that is powerful enough to offset all  
> other positive  
> feedbacks. Using detailed daily observations of cloud cover  
> from  
> satellites in the tropics and comparing them to sea surface  
> temperatures,  
> the researchers found that there is an "iris effect" in which  
> higher  
> temperatures reduce the warming effect of clouds.  
>  
> According to a NASA statement about the study, "Clouds play a  
> critical  
> and complicated role in regulating the temperature of the  
> Earth. Thick,  
> bright, watery clouds like cumulus shield the atmosphere from  
> incoming  
> solar radiation by reflecting much of it back into space.  
> Thin, icy cirrus  
> clouds are poor sunshields but very efficient insulators that  
> trap energy  
> rising from the Earth's warmed surface. A decrease in cirrus  
> cloud area  
> would have a cooling effect by allowing more heat energy, or  
> infrared  
> radiation, to leave the planet." [3]  
>  
> The researchers found that a one degree Celsius rise in ocean  
> surface  
> temperature decreased the ratio of cirrus cloud area to  
> cumulus cloud  
> area by 17 to 27 percent, allowing more heat to escape.  
>  
> In an interview, lead author Dr. Richard S. Lindzen said the  
> climate  
> models used in the IPCC have the cloud physics wrong. "We  
> found that  
> there were terrible errors about clouds in all the models,  
> and that that will  
> make it impossible to predict the climate sensitivity because  
> the  
> sensitivity of the models depends primarily on water vapor  
> and clouds.  
> Moreover, if clouds are wrong, there's no way you can get  
> water vapor  
> right. They're both intimately tied to each other." Lindzen  
> argues that  
> due to this new finding he doesn't expect "much more than a

> degree  
> warming and probably a lot less by 2100."[4]  
>  
> The study is the best empirical confirmation to date of the  
> negative  
> feedback hypothesis proposed by Lindzen early on in the  
> global warming  
> debate. It builds on earlier empirical work by Drs. Roy  
> Spencer of NASA  
> and William Braswell of Nichols Research Corporation. Their  
> 1997 study  
> also cast doubt on the assumption of a positive water vapor  
> feedback  
> effect.[5] They found that the tropical troposphere, the  
> layer of air  
> between 25,000 and 50,000 feet, is much dryer than climate  
> modelers  
> previously thought. Further empirical work will no doubt  
> confirm whether  
> this phenomenon is common throughout the tropics, which act  
> as the  
> Earth's exhaust vents for escaping heat.

>  
>  
> Black Carbon. In 1995, the IPCC had to explain in its Second  
> Assessment Report why its previous predictions of global  
> temperature  
> change were nearly three times larger than observed in the  
> actual  
> temperature record. The SAR concluded that emissions of  
> sulfate  
> aerosols from burning coal were offsetting the warming that  
> should be  
> caused by carbon dioxide levels in the atmosphere. Sulfate  
> aerosols,  
> according to this explanation, reflect incoming solar  
> radiation back to  
> space, thereby cooling the planet.

>  
>  
> The TAR takes the sulfate aerosol idea even further. The SAR  
> had  
> predicted a temperature rise of 1 to 3.5 degrees C (1.8 to  
> 6.3 degrees F)  
> over the next 100 years. The TAR goes even further,  
> anticipating a 1.4 to  
> 5.8 degrees C (2.52 to 10.44 degrees F) rise in temperature.  
> The  
> extreme case scenario of a 5.8 degrees C of warming, for  
> instance, is  
> based partly on assumptions that the whole world will raise  
> its level of  
> economic activity to that of the U.S., will equal U.S. per  
> capita energy

> use, and energy use will be carbon intensive. The primary  
> assumption  
> behind the new scenario, however, is that sulfate aerosol  
> emissions will  
> be eliminated by government regulation, giving carbon dioxide  
> free  
> reign.[6]  
>  
> Sulfate aerosols, then, are a key component of catastrophic  
> global  
> warming scenarios. Without them, the IPCC cannot explain why  
> the  
> earth is not warming according to their forecasts, nor can  
> they  
> reasonably claim that global warming will lead to  
> catastrophes of biblical  
> proportions.  
>  
> A new study in Nature eliminates sulfate aerosols as a  
> corrective for the  
> models. [7] The author, Mark Jacobson, a professor with the  
> Department  
> of Civil & Environmental Engineering at Stanford University,  
> examines  
> how black carbon aerosols affect the Earth's climate. Unlike  
> other  
> aerosols that reflect solar radiation back into space, black  
> carbon (soot)  
> absorbs solar radiation, thereby raising atmospheric  
> temperatures.  
>  
> Until now the warming influence of black carbon was thought  
> to be minor,  
> leading researchers to ignore it. James Hansen, with the  
> Goddard  
> Institute for Space Studies, in a paper published in August  
> 2000, first  
> suggested that black carbon plays an important role in global  
> warming.[8] Jacobson found "a higher positive forcing from  
> black carbon  
> than previously thought, suggesting that the warming effect  
> from black  
> carbon may nearly balance the net cooling effect of other  
> anthropogenic  
> aerosol constituents."  
>  
> There you have it. Soot offsets the cooling effect of other  
> aerosols,  
> meaning we are back at square one. Scientists still do not  
> have a  
> plausible explanation for why the Earth has failed to warm in  
> line with  
> climate model results. Indeed, all the prognostications of  
> the IPCC are

> wrong if the Nature study is right.  
>  
>  
> Natural Cycles. The main propaganda device of the TAR is the  
> "hockey  
> stick graph." The graph is a temperature record derived from  
> tree rings  
> dating back to 1000 AD and running through 1900, with the  
> 20th century  
> thermometer-based temperature data attached at the end.[9]  
> It claims to  
> show that global temperatures have remained steady or even  
> decreased  
> during the last millennium until the industrial age, when  
> there was an  
> anomalous warming represented by the blade of the hockey  
> stick. The  
> hockey stick is largely bogus, however. The margin of error  
> is so large  
> that nearly any temperature trend could be drawn to fit  
> within it.  
>  
>  
>  
> The hockey stick features prominently in all of IPCC Chairman  
> Robert  
> Watson's speeches, and to the uninitiated it is very  
> persuasive. Senator  
> John McCain (R-AZ), for example, expressed alarm when he saw  
> the  
> graph at Commerce Committee hearings last May.  
>  
>  
> Watson uses the hockey stick to claim that current warming is  
> greater  
> than at any other time in the last 1,000 years. The Medieval  
> Warm  
> Period (MWP) and the Little Ice Age (LIA) were two naturally  
> occurring  
> events during the last millennium where the range of global  
> temperature  
> change exceeded that of the 20th century. During the MWP,  
> global  
> temperatures were higher than they are today. The MWP,  
> however, does  
> not show up in the hockey stick graph.  
>  
> The hockey stick has effectively been dismantled in a recent  
> study in  
> Science, however.[10] Wallace Broecker, of the  
> Lamont-Doherty Earth  
> Observatory, argues that the MWP and the LIA were indeed  
> global  
> phenomena. Referring to the hockey stick, Broecker notes, "A

> recent,  
> widely cited reconstruction leaves the impression that the  
> 20th century  
> warming was unique during the last millennium. It shows no  
> hint of the  
> Medieval Warm Period (from around 800 to 1200 A.D.) during  
> which the  
> Vikings colonized Greenland, suggesting that this warm event  
> was  
> regional rather than global. It also remains unclear why just  
> at the dawn  
> of the Industrial Revolution and before the emission of  
> substantial  
> amounts of anthropogenic [manmade] greenhouse gases, Earth's  
> temperature began to rise steeply."  
>  
>  
> Broecker reviewed several scientific studies which  
> reconstruct the Earth's  
> temperature history into the distant past using various  
> proxies. He  
> concludes, "The post-1860 natural warming was the most recent  
> in a  
> series of similar warmings spaced at roughly 1500-year  
> intervals  
> throughout the present interglacial, the Holocene." [11] In  
> other words,  
> the current warm period may just be attributable to natural  
> cycles.  
>  
>  
> Flawed Temperature Data. The National Oceanic and  
> Atmospheric  
> Administration (NOAA) claimed that the year 2000 was the  
> sixth  
> warmest since 1880. Other temperature records find less  
> warming. [12]  
> Last year was only the 14th warmest, or 9th coolest, year  
> since 1979  
> according to the satellite temperature record, [13] and only  
> the 9th  
> warmest, according to records that include only measurements  
> from  
> meteorological stations. [14]  
>  
> The NOAA data, which is cited by government officials and the  
> news  
> media, may be the least accurate, according to a study that  
> recently  
> appeared in Geophysical Research Letters. [15] The NOAA  
> datasets "are  
> a mixture of near-surface air temperatures over land and sea  
> water  
> temperatures over oceans," according to lead author Dr. John

> Christy,  
> professor of atmospheric science and director of the Earth  
> System  
> Science Center at the University of Alabama in Huntsville.  
>  
> Since actual air temperature data over many large ocean areas  
> are  
> nonexistent, the NOAA uses sea surface temperatures as a  
> "proxy,"  
> assuming that sea surface temperatures and air temperatures  
> move in  
> lock step. This is not the case, according to the data  
> compiled by  
> Christy and his colleagues at the Hadley Centre of the United  
> Kingdom's  
> Meteorological Office, who worked on the study. The  
> researchers used  
> buoy data in the tropical Pacific Ocean to compare "long-term  
> (8-20 year)  
> trends for temperatures recorded one meter below the sea  
> surface and  
> three meters above it."  
>  
> What they found was a significant discrepancy. "For each  
> buoy in the  
> Eastern Pacific, the air temperatures measured at the three  
> meter height  
> showed less of a warming trend than did the same buoy's water  
> temperatures at one meter depth," the study said. The  
> difference is a  
> near-surface seawater warming trend of 0.37 degrees C per  
> decade and  
> an air temperature trend of only 0.25 degrees C per decade  
> during the  
> 20-year period tested. Replacing the sea surface  
> temperatures with the  
> air temperature data reduces the Earth's global warming trend  
> by a third,  
> from 0.19 to 0.13 degree C per decade.  
>  
> This is significant due to difficulties with reconciling the  
> various global  
> temperature data sets, particularly the discrepancy between  
> tropospheric  
> temperatures measured by satellites that show little to no  
> warming, and  
> the surface-based temperature data that show slightly more  
> warming.  
> Last year, the National Research Council stated that both  
> temperature  
> records are correct and speculated about an explanation.[16]  
>  
> This brings up another problem, however. The standard  
> explanation of

> the greenhouse effect suggests warming occurs first five  
> kilometers  
> above the earth's surface in the atmospheric layer known as  
> the  
> troposphere. How events at the surface are connected to what  
> happens  
> high in the atmosphere is not clear, but it is believed that  
> surface  
> warming would follow tropospheric warming through climatic  
> processes  
> such as air circulation.[17] If both temperature records are  
> correct, then  
> this explanation of the greenhouse effect is wrong. Christy  
> et al. brings  
> the surface temperature data into closer agreement with the  
> satellite  
> data, suggesting that a better explanation for the  
> discrepancy is flawed  
> surface data.  
>  
> Progressive Science. At a press conference at the National  
> Press  
> Club on April 18, Mr. Jan Pronk, chairman of the Sixth  
> Conference of the  
> Parties of the United Nations Framework Convention on Climate  
> Change  
> said most issues were still on the table in the ongoing Kyoto  
> negotiations  
> but the scientific basis of catastrophic global warming could  
> not be  
> questioned. That would be like going back ten years, he  
> said. This is a  
> myopic and erroneous view of science. Science is not static  
> but  
> dynamic. It reaches tentative conclusions at best, and those  
> conclusions constantly give way to new data. The IPCC is a  
> static  
> process, however. The Third Assessment Report is already  
> obsolete and  
> it has not even been released yet. With these four recent  
> studies, it may  
> be time to bid catastrophic global warming theory a warm  
> farewell.

> [1] "Evidence of Rapid Global Warming Accepted by 99 Nations,"  
> Environment News Service, January 22,

> 2001.

> [2] Richard S. Lindzen, Ming-Dah Chou, and Arthur Y. Hou, "Does the  
> Earth Have an Adaptive Infrared Iris?,"

> Bulletin of the American Meteorological Society, 82:417-32, March

> 2001.

> [3] <ftp://www.gsfc.nasa.gov/pub/PAO/Releases/2001/01-18.htm>

> [4] "Is Globe Warming? Sure, But Far Less than Alarmists Say,"

> Tech Central Station

> (<http://www.techcentralstation.com/BigShotFriday.asp>), March 5,

> 2001.

> [5] Roy W. Spencer and William D. Braswell, "How Dry is the

> Tropical Free Troposphere? Implications for

> Global Warming Theory," *Bulletin of the American Meteorological*

> *Society*, 78:1097-1106.

> [6] In correspondence with *Nature* magazine, one of the IPCC's

> coordinating lead authors, Thomas Stocker of

> the Physics Institute at the University of Bern in Switzerland,

> wrote, "First, although climate modeling has

> advanced during the past five years, this is not the main reason

> for the revised range of temperature

> projections. The higher estimates of maximum warming by the year

> 2100 stem from a more realistic view of

> sulphate aerosol emissions. The new scenarios assume emissions

> will be reduced substantially in the coming

> decades, as this becomes technically and economically feasible, to

> avoid acid rain. Sulphate emissions have

> a cooling effect, so reducing them leads to higher estimates of

> warming." See "Climate panel looked at all

> the evidence," *Nature*, 410: 299, March 15, 2001.

> [7] Mark Z. Jacobson, "Strong radiative heating due to the mixing

> state of black carbon in atmospheric

> aerosols," *Nature*, 409: 695-72, February 8, 2001.

> [8] James D. Hansen, Makiko Sato, Reto Ruedy, Andrew Lacis, and

> Valdir Oinas, "Global Warming in the

> twenty-first century: An alternative scenario," *Proceedings of the*

> *National Academy of Sciences*,

> 97:9875-9880.

> [9] The tree ring data originated with Michael E. Mann, Raymond S.

> Bradley and Malcolm K. Hughes,

> "Northern Hemisphere Temperatures During the Past Millennium:

> Inferences, Uncertainties, and Limitations,"

> *Geophysical Research Letters*, 26: 759, March 15, 1999.

> [10] Wallace S. Broecker, "Was the Medieval Warm Period Global?"

> *Science*, 291: 1497-99, February 23,

> 2001.

> [11] Also see H.H. Lamb, *Climate History and the Modern World*, (New

> York: Routledge, 1985), and Brian

> Fagan, *The Little Ice Age: How Climate Made History, 1300-1850*,

> (New York: Basic Books, 2000).

> [12] <http://www.ncdc.noaa.gov/ol/climate/research/2000/ann/ann.html>

> [13] <http://www.ghcc.msfc.nasa.gov/MSU/msusci.html>

> [14] <http://www.john-daly.com/press/press-01.htm#Phil>

> [15] John R. Christy, David E. Parker, Simon J. Brown, Ian Macadam,

> Martin Stendal, and William B. Norris,

> "Differential Trends in Tropical Sea Surface and Atmospheric

> Temperatures since 1979," *Geophysical*

> *Research Letters*, 28:183.

> [16] Reconciling Observations of Global Temperature Change,

> National Academy Press: Washington, D.C.,  
> 2000.  
> [17] Richard S. Lindzen, "Climate Forecasting: When Models are  
> Qualitatively Wrong," George C. Marshall  
> Institute, Washington, D.C., 2000.  
>  
>  
>  
> ©5/16/01 Competitive Enterprise Institute

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Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
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Charlottesville, VA 22903

---

e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (804) 924-7770 FAX: (804) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: email spam  
From: "Raymond S. Bradley" <rbradley@geo.umass.edu>  
Date: 6/14/01 6:48 AM  
To: mann@multiproxy.evsc.virginia.edu, mhughes@ltrr.arizona.edu, srutherford@virginia.edu

FYI, You can remove commercial email spam by request at this address:  
<http://www.e-mps.org/en/>  
It won't stop messages from Dietze, Daly etc but it might cut down some other garbage  
ray

Raymond S. Bradley  
Professor and Head of Department  
Department of Geosciences  
University of Massachusetts  
Amherst, MA 01003-5820

Tel: 413-545-2120  
Fax: 413-545-1200  
Climate System Research Center: 413-545-0659  
Climate System Research Center Web Page: <<http://www.geo.umass.edu/climate/climate.html>>  
Paleoclimatology Book Web Site (1999): <http://www.geo.umass.edu/climate/paleo/html>

Subject: Re: Special issue--geothermal data  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 6/20/01 6:45 PM  
To: Scott Rutherford <srutherford@virginia.edu>  
CC: "Raymond S. Bradley" <rbradley@geo.umass.edu>, mann@multiproxy.evsc.virginia.edu,  
srutherford@virginia.edu, mhughes@ltrr.arizona.edu

Interestingly, just ran into this too:

<http://www.co2science.org/journal/2001/v4n25c1.htm>

At 05:26 PM 6/20/01 -0400, Scott Rutherford wrote:

> Ray et al.

>

> I found the paper on the 80,000 year temperature history from a 5+km deep borehole that (1) hasn't equilibrated after drilling, (2) assumes no heat source (hmm, I learned in intro geology that there is a heat source), (3) assumes a homogenous medium of basalts and tuffs (that's homogeneous?!?), and (4) has temperature gradient variability on the order of the temperature measurement error to be quite convincing. I'm now convinced at least part of borehole community is nuts.

>

> -Scott

>

>

> At 4:44 PM -0400 6/20/01, Raymond S. Bradley wrote:

>> Journal: Global and Planetary Change

>> ISSN : 0921-8181

>> Volume : 29

>> Issue : 3-4

>> Date : Jun-2001

>> Please note: The access restrictions on articles/abstracts vary. Many journals have free access to abstracts, but in general access to full text PDFs is restricted to subscribers.

>> Visit the journal at <http://www.elsevier.nl/locate/jnlr/05335>

>>

>> pp 149-152

>> Foreword: Inference of climate change from geothermal data

>> H. Beltrami, R.N. Harris

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>> D.S. Chapman

>> pp 155-165

>> Ground surface temperature history at a single site in southern Portugal

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>> <http://www.elsevier.nl/PII/S092181810100087X>

>> pp 167-188

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>> borehole temperatures and meteorological data

>> I.V. Golovanova, R.N. Harris, G.V. Selezniova, P. Stulc

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>> Climate change of the last 2000 years inferred from borehole temperatures:

>> data from Finland

>> L. Bodri, V. Cermak, I.T. Kukkonen

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>> pp 201-217  
>> Long wavelength ground surface temperature history from continuous  
>> temperature logs in the Transylvanian Basin  
>> D.Z. Serban, S.B. Nielsen, C. Demetrescu  
>> <http://www.elsevier.nl/PII/S092181810100090X>  
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>> 80,000 years ground surface temperature history inferred from the  
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>> Russia)  
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>> <http://www.elsevier.nl/PII/S0921818101000911>  
>> pp 231-239  
>> Composite surface temperature history from simultaneous inversion of  
>> borehole temperatures in western Canadian plains  
>> J.A. Majorowicz, J. Safanda  
>> <http://www.elsevier.nl/PII/S0921818101000923>  
>> pp 241-257  
>> Signature of the last ice age in the present subsurface temperatures in the  
>> Czech Republic and Slovenia  
>> J. Safanda, D. Rajver  
>> <http://www.elsevier.nl/PII/S0921818101000935>  
>> pp 259-273  
>> Numerical modelling of permafrost in bedrock in northern Fennoscandia  
>> during the Holocene  
>> I.T. Kukkonen, J. Safanda  
>> <http://www.elsevier.nl/PII/S0921818101000947>  
>> pp 275-292  
>> Non-conductive heat transfer associated with frozen soils  
>> D.L. Kane, K.M. Hinkel, D.J. Goering, L.D. Hinzman, S.I. Outcalt  
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>> pp 311-325  
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>> pp 351-352  
>> Contents Volume 29, 2001  
>> <http://www.elsevier.nl/PII/S0921818101001072>  
>>  
>>  
>> Raymond S. Bradley

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>> Department of Geosciences  
>> University of Massachusetts  
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>> Tel: 413-545-2120  
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>> Climate System Research Center: 413-545-0659  
>> Climate System Research Center Web Page: <<http://www.geo.umass.edu/climate/climate.html>>  
>> Paleoclimatology Book Web Site (1999): <http://www.geo.umass.edu/climate/paleo/html>

>  
> --

>  
> \_\_\_\_\_  
> Scott Rutherford  
>

> University of Virginia University of Rhode Island  
> Environmental Sciences Graduate School of Oceanography  
> Clark Hall South Ferry Road  
> Charlottesville, VA 22903 Narragansett, RI 02882  
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> phone: (804) 924-4669 (401) 874-6599  
> fax: (804) 982-2137 (401) 874-6160

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<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: Special issue-- geothermal data  
From: "Raymond S. Bradley" <rbradley@geo.umass.edu>  
Date: 6/20/01 1:44 PM  
To: mann@multiproxy.evsc.virginia.edu, srutherford@virginia.edu, mhughes@ltrr.arizona.edu

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ISSN : 0921-8181

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Visit the journal at <http://www.elsevier.nl/locate/jnlr/05335>

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<http://www.elsevier.nl/PII/S0921818101001072>

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Climate System Research Center: 413-545-0659

Climate System Research Center Web Page: <<http://www.geo.umass.edu/climate/climate.html>>

Paleoclimatology Book Web Site (1999): <http://www.geo.umass.edu/climate/paleo/html>

Subject: Re: Asheville workshop(s)  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 1/4/02 10:03 AM  
To: Anne.Waple@noaa.gov  
CC: hfd@cdc.noaa.gov, rbradley@geo.umass.edu, mhughes@ltrr.arizona.edu, Connie.Woodhouse@noaa.gov, mann@virginia.edu, srutherford@virginia.edu, Cary Mock <MockCJ@gwm.sc.edu>

Yes-I have a similar problem to Cary, and suspect Ray and others do too.

Why not make it the week of May 13-17? Any objections from the others?

mike

At 11:56 AM 1/4/02 -0500, Cary Mock wrote:

> Anne,  
> That part of May is the start of finals week here, and I am expected to  
> probably also go to commencement for graduates on May 11. Any way we  
> can do it after those dates?  
>  
> Cary  
>  
> "Anne Waple" <Anne.Waple@noaa.gov> 01/04/02 11:31AM >>>  
> Hi all,  
> Just a heads-up in terms of dates for a workshop in Asheville.  
> There is a drought Monitoring workshop here on the 26th and 27th of  
> April  
> (probably). And we should think about reserving a couple of days  
> ourselves to ensure that we have appropriate rooms and equipment. I  
> can  
> also probably reserve a block of rooms in the Renaissance or  
> something.  
> Do we have any dates in mind yet? Perhaps the first week of May?  
> 1st-3rd  
> (wed-Fri)? Just let me know.  
> Cheers  
> Anne  
>  
>  
> --  
> -----  
> Anne M. Waple  
> Research Scientist  
> National Climatic Data Center  
> 151 Patton Avenue  
> Asheville, NC 28801 USA  
> phone: +1-828-271-4794  
> Anne.Waple@noaa.gov  
>  
>  
>  
> -----  
> Cary J. Mock, mockcj@sc.edu  
> Department of Geography

> University of South Carolina  
> Columbia SC 29208, U.S.A.  
> (803) 777-1211 (office)  
> (803) 777-4972 (fax)  
> <http://www.cla.sc.edu/geog/facStaff/mock.html>

---

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<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: hansen note in Science

From: "Raymond S. Bradley" <rbradley@geo.umass.edu>

Date: 1/12/02 12:44 PM

To: mann@multiproxy.evsc.virginia.edu, srutherford@virginia.edu, mhughes@ltrr.arizona.edu

<http://www.sciencemag.org/cgi/content/full/295/5553/275c>

## Global Warming Continues

The second warmest global surface temperature in more than a century of instrumental data (1) was recorded in the 2001 meteorological year (December 2000 through November 2001) (see panel A). The calendar year 2001 will also be the second warmest year on record, as the 11-month temperature anomaly exceeds that in the next warmest years (1990 and 1995) by almost  $0.1^{\circ}\text{C}$ . For our analysis, we used recently documented procedures for data over land (1) and for sea surface temperatures (2).

The global warmth in 2001 is particularly meaningful because it occurs at a phase of the Southern Oscillation in which the tropical Pacific Ocean is cool (see panel B). The record warmth of 1998, in contrast, was bolstered by a strong El Niño that raised global temperature  $0.2^{\circ}\text{C}$  above the trend line (see panel A).

Global surface air warming over the past 25 years is  $\sim 0.5^{\circ}\text{C}$ , and in the past century is  $\sim 0.75^{\circ}\text{C}$  (1). The recent surface warming contrasts with warming of only  $\sim 0.1^{\circ}\text{C}$  in the troposphere over the past 22 years (3); however, surface and tropospheric warmings are similar over the past 50 years (4). The greatest warm anomalies in 2001 were in Alaska-Canada, in a band from North Africa to Central Asia, and in the Antarctic peninsula (Palmer Land). The Indian and Western Pacific oceans were unusually warm, continuing a trend of recent decades (1).

The North Atlantic Ocean is notably warmer than the 1951-1980 climatology. Unusually cool conditions of recent decades, which were centered in Baffin Bay and extended south and southeast of Greenland (1), have given way to warm anomalies in the past 5 years.

Overall, the 2001 temperature extends the unusual global warming of recent decades. This warming is considered to be a consequence of anthropogenic greenhouse gases (5), and thus the high 2001 temperature will likely invigorate discussions about how to slow global warming.

J. Hansen,\* R. Ruedy, M. Sato, K. Lo  
NASA Goddard Institute for Space Studies,  
New York, NY 10025, USA

\*To whom correspondence should be addressed.  
E-mail: [jhansen@giss.nasa.gov](mailto:jhansen@giss.nasa.gov)

## References and Notes

1. J. Hansen et al., *J. Geophys. Res.* 106, 23947 (2001).

- 2.R. W. Reynolds, N. A. Rayner, T. M. Smith, D. C. Stokes, W. Wang, J. Climate, in press.
- 3.J. R. Christy, R. W. Spencer, W. D. Braswell, J. Atmos. Oceanic Technol. 17, 1153 (2000).
- 4.National Research Council, Reconciling Observations of Global Temperature Change (National Academy of Sciences, Washington, DC, 2000).
- 5.J. T. Houghton et al., Eds., Intergovernmental Panel on Climate Change (IPCC), Climate Change 2001 (Cambridge Univ. Press, New York, 2001).

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Paleoclimatology Book Web Site (1999): <http://www.geo.umass.edu/climate/paleo/html>

Subject: Fwd: Abstract Confirmation  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 2/14/02 2:03 PM  
To: Scott Rutherford <srutherford@virginia.edu>, mhughes@ltrr.arizona.edu, rbradley@geo.umass.edu

Yippee!

> Date: Thu, 14 Feb 2002 20:58:10 +0100  
> From: manager@cosis.net  
> Subject: Abstract Confirmation  
> To: mann@virginia.edu  
> X-AntiVirus: OK! AvMailGate Version 6.12.1.15  
> at medusa.copernicus.org has not found any known virus in this email.  
>  
> Dear Prof. Michael Mann,  
> We are happy to inform you that your abstract EGS02-A-01895 entitled  
> "Climate Change and Forcing over the Past 500 Years"  
> by "MANN, M.E.; RUTHERFORD, S.; BRADLEY, R.S.; HUGHES, M.K."  
> has been accepted for presentation at the  
> Meeting / Conference: "27th General Assembly of the European Geophysical Society".  
> Further details regarding the schedule of your presentation will be sent  
> to you after the meeting programme has been finalized. Please, follow  
> all details concerning the meeting and its programme online on:  
> <http://www.copernicus.org/EGS/egsga/nice02/nice02.htm>  
> and inform your co-authors about the acceptance of your abstract.  
> Acceptance of your contribution carries with it the OBLIGATION for you or,  
> at least, for one of your co-authors to actually present it at the meeting.  
> If you or your co-authors feel that you may not be able to meet this  
> obligation, we would appreciate receiving a notice from you  
> by 20 February 2002.  
> Looking forward to seeing you at the meeting.  
>  
> Kind regards,  
> Your COSIS Manager  
> manager@cosis.net  
>  
> -----  
> COSIS.net - Copernicus Online Service + Information System  
> <http://www.cosis.net>  
> -----

---

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e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: Esper et al  
From: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>  
Date: 3/22/02 2:02 PM  
To: mhughes@ltrr.arizona.edu, rbradley@geo.umass.edu, Scott Rutherford <srutherford@gso.uri.edu>, mann@virginia.edu

Just got off the phone talking w/ the NY Times. Perhaps we'll have some balance in the story that they produce!

mike

---

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Charlottesville, VA 22903

---

e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: NPR  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 3/28/02 3:07 PM  
To: mhughes@ltrr.arizona.edu, rbradley@geo.umass.edu

Ray, Malcolm:

I have an interview w/ NPR tomorrow (around 3:40 PM) on "TALK OF THE NATION", another opportunity to help clarify "the record" so to speak...

Mike

---

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Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

---

e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: Fwd: Hello  
From: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>  
Date: 4/12/02 9:48 AM  
To: rbradley@geo.umass.edu, mhughes@ltrr.arizona.edu, Scott Rutherford <srutherford@gso.uri.edu>  
CC: mann@virginia.edu

FYI...

Mike

> X-Authentication-Warning: cayman.cgd.ucar.edu: jhurrell owned process doing -bs  
> Date: Fri, 12 Apr 2002 10:20:43 -0600 (MDT)  
> From: Jim Hurrell <jhurrell@cgd.ucar.edu>  
> X-Sender: <jhurrell@cayman.cgd.ucar.edu>  
> To: mann@virginia.edu  
> MMDF-Warning: Parse error in original version of preceding line at mail.virginia.edu  
> Subject: Hello

> Hi Mike,

> It has been so long, I just wanted to say hello. I was prompted to  
> write based on some discussions I was having with Kevin over the Esper  
> et al. article. I saw your letter to Science with Malcolm on the  
> printer, and read it! What a nice letter -- I hope it is published.

> At any rate, you are doing terrific work and keep up the good job.  
> I hope all is well, and I look forward to crossing paths at some  
> future meeting!

> My life has been consumed with CLIVAR lately, but I have some  
> interesting work about summer decadal variability maybe we could  
> discuss sometime. I have also put together a book on the NAO, based  
> on a chapman conference, that I hope is published by Christmas. Ed  
> Cook is an author of a chapter on multi-proxy reconstructions of the  
> NAO.

> Take care.

> Jim

> -----  
> James W. Hurrell                      Phone: 303-497-1383  
> National Center for Atmospheric Research    Fax: 303-497-1333  
> Climate Analysis Section                      email: jhurrell@ucar.edu  
> P. O. Box 3000                              http://www.cgd.ucar.edu/~jhurrell  
> Boulder, CO 80307-3000

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<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: away from my mail  
From: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>  
Date: 4/25/02 9:46 AM  
To: mhughes@ltrr.arizona.edu

I will not be reading my email from 4/18/02-4/27/02.  
Your email concerning "Re: Your letter to SCIENCE"  
will be read when I return.

Subject: Exchange?  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 5/3/02 6:17 AM  
To: mhughes@ltrr.arizona.edu

Malcolm,

What do you think about the exchange?

mike

---

Professor Michael E. Mann  
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University of Virginia  
Charlottesville, VA 22903

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e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: another study  
From: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>  
Date: 6/7/02 9:21 AM  
To: ray Bradley <rbradley@geo.umass.edu>, Malcolm Hughes <mhughes@ltrr.arizona.edu>, Scott Rutherford <srutherford@gso.uri.edu>

Dear All:

AGU was very interesting--the vast majority of corals are showing LIA cooling of 0.3-0.5C or so. Dick Kerr is doing a story on our session next week.

Meanwhile, an increasing number of modeling studies are showing results quite close to our reconstruction, including this one (I've requested a reprint) which I've summarized below from the Belgium group, and the attached pdf file from the Claussen et al group as well as the Gerber et al paper which I've attached (final version) here too, showing that the model simulations similar to our reconstruction provide co2 variations which best match the ice cores...

mike

---

Climate of the last millennium: a sensitivity study  
Bertrand C, Loutre MF, Crucifix M, Berger A  
TELLUS SERIES A-DYNAMIC METEOROLOGY AND OCEANOGRAPHY  
54 (3): 221-244 MAY 2002

Document type: Article  
Language: English  
Cited References: 97  
Times Cited: 0

**Abstract:**  
Seventy-one sensitivity experiments have been performed using a two-dimensional sector-averaged global climate model to assess the potential impact of six different factors on the last millennium climate and in particular on the surface air temperature evolution. Both natural (i.e. solar and volcanism) and anthropogenically-induced (i.e. deforestation, additional greenhouse gases, and tropospheric aerosol burden) climate forcings have been considered.

Comparisons of climate reconstructions with model results indicate that all the investigated forcings are needed to simulate the surface air temperature evolution. Due to uncertainties in historical climate forcings and temperature reconstructions, the relative importance of a particular forcing in the explanation of the recorded temperature variance is largely function of the forcing time series used. Nevertheless, our results indicate that whatever the historical solar and volcanic reconstructions may be, these externally driven natural climate forcings are unable to drive climate responses comparable in magnitude and time to the late-20th-century temperature warming while for earlier periods combination of solar and volcanic forcings can explain the Little Ice Age and the Medieval Warm Period. Only the greenhouse gas forcing allows the model to simulate an accelerated warming rate during the last three decades. The best guess simulation

(largest similarity with the reconstruction) for the period starting 1850 AD requires however to include anthropogenic sulphate forcing as well as the impact of deforestation to constrain the magnitude of the greenhouse gas twentieth century warming to better fit the observation. On the contrary, prior to 1850 AD mid-latitude land clearance tends to reinforce the Little Ice age in our simulations.

---

Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

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e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Attachments:

ema4.pdf 755 KB  
gerber\_revised\_5jun02.pdf 1.5 MB

Subject: away from my mail  
From: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>  
Date: 6/7/02 7:14 AM  
To: mhughes@ltrr.arizona.edu

I will be travelling through June 24.  
Your message concerning "question"  
will be read when I return.

Subject: Re: help again  
From: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>  
Date: 6/7/02 12:02 PM  
To: Tom Crowley <tcrowley@duke.edu>  
CC: Malcolm Hughes <mhughes@ltrr.arizona.edu>

Hi Tom,

Nope, not off hand, but I've forward to Malcolm who can probably help us...

mike

At 02:14 PM 6/7/02 -0400, you wrote:

> Mike,  
>  
> trying to track down the reference to Taimyr Peninsula long TR site -- cant seem to find it - do you by any chance recall where this is from?  
>  
> Tom  
> --  
> Thomas J. Crowley  
> Nicholas Professor of Earth Systems Science  
> Dept. of Earth and Ocean Sciences  
> Nicholas School of the Environment and Earth Sciences  
> Box 90227  
> 103 Old Chem Building  
> Duke University  
> Durham, NC 27708  
>  
> tcrowley@duke.edu  
> 919-681-8228  
> 919-684-5833 fax

---

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Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

---

e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: Re: Source Data  
From: Malcolm Hughes <mhughes@lrr.arizona.edu>  
Date: 7/3/02 1:43 PM  
To: "Michael E. Mann" <mann@virginia.edu>

Interesting! MAlcolm

.

Subject: Re: Source Data  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 7/3/02 12:34 PM  
To: Justin Kopetsky <Macro1@cbo.gov>  
CC: mann@virginia.edu, ckfolland@meto.gov.uk, tkarl@ncdc.noaa.gov, jouzel@lsce.saclay.cea.fr

Dear Justin,

I'm truly fascinated that the CBO is interested in looking at paleoclimate data (!), and I'm more than happy to help to the extent I can:

I was involved in the preparation of only one of these figures (2.20). You would need to consult with other lead authors of chapter 2 of the IPCC report regarding data used in Figure 2.8 (either Chris Folland or Tom Karl) or Figure 2.22 (Dr. Jean Jouzel).

The data used in Figure 2.20 are available here:

<http://www.people.virginia.edu/~mem6u/mbh99.html>

The black curve shown is simply a 40 yr smoothed version of the blue curve, as described in the figure caption. Note also that the reference period (1961-1990) used in the report is slightly different, (which amounts simply to a mean offset of all of the curves) from the 1902-1980 reference period used in the data on the website. Note also that the instrumental record (red curve) has been updated relative to the data provided on the website (the 1998 value revised based on the availability of final few months of data, and the 1999 value included) in the report. The most up-to-date version of the Northern Hemisphere instrumental record is available through the University of East Anglia Climatic Research Unit website:

<http://www.cru.uea.ac.uk/cru/data/temperature/>

I hope you find this information of help. Best of luck in your endeavors, and best regards,

Mike Mann

At 01:50 PM 7/1/2002 -0400, you wrote:

> Dr. Mann,

>

> My name is Justin Kopetsky of the Congressional Budget Office and recently I have been trying to recreate several graphs in Climate Change 2001: The Scientific Basis. The specific figures are 2.8, 2.20, and 2.22 on pages 115, 134, and 137, respectively. These are all in a chapter that listed you as lead author and I was hoping that you may be able to provide the data used to construct these graphs or give me some direction as to where to look next. Any assistance you can offer would be greatly appreciated.

>

> Thank you for your time.

>

> Justin Kopetsky

> Congressional Budget Office

> 202 226-0669

---

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Charlottesville, VA 22903

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Subject: refine, etc  
From: Malcolm Hughes <mhughes@ltrr.arizona.edu>  
Date: 7/15/02 10:07 PM  
To: mann@virginia.edu

Mike - just checking in to say your recollection and mine  
coincide, Cheers, Malcolm

Subject: this just in...

From: "Raymond S. Bradley" <rbradley@geo.umass.edu>

Date: 11/1/02 9:51 AM

To: mann@multiproxy.evsc.virginia.edu, srutherford@virginia.edu, mhughes@ltrr.arizona.edu

> Date: Sat, 02 Nov 2002 09:35:36 -0700

> From: "Dr. Jacek Majorowicz" <majorowicz@shaw.ca>

> Subject: majorowicz/jgr

> To: rbradley@geo.umass.edu

> Organization: Northern Geothermal

> X-Mailer: Microsoft Outlook Express 6.00.2720.3000

>

> Dear Sir:

> Enclosed is across Canada study of warming/cooling patterns from well temperature data which I have just published in October issue of JGR Red.

> I hope that it may be of interest to you.

> With best regards

> Majorowicz

> Edmonton, Canada

Raymond S. Bradley

Distinguished Professor and Head of Department

Department of Geosciences

Morrill Science Center

611 North Pleasant Street

AMHERST, MA 01003-9297

Tel: 413-545-2120

Fax: 413-545-1200

Climate System Research Center: 413-545-0659

Climate System Research Center Web Page: <<http://www.paleoclimate.org>>

Paleoclimatology Book Web Site: <http://www.geo.umass.edu/climate/paleo/html>

Attachments:

2001JB000519.pdf      675 KB

Subject: FYI  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 11/11/02 4:58 PM  
To: mann@virginia.edu

Dear Friends & Colleagues,

Thought you might be interested in this. I just found out about it today:

[http://www.sciam.com/print\\_version.cfm?articleID=00052728-1BFF-1DD0-A060809EC5880106](http://www.sciam.com/print_version.cfm?articleID=00052728-1BFF-1DD0-A060809EC5880106)

(go half way down the page).

It will appear in the next issue of Scientific American at the newstands...

mike

---

Professor Michael E. Mann  
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University of Virginia  
Charlottesville, VA 22903

---

e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: Re: FYI  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 11/11/02 6:50 PM  
To: Malcolm Hughes <mhughes@ltrr.arizona.edu>

thanks malcolm, i guess there will be more in the actual issue when it comes out...

mike

At 06:55 PM 11/11/2002 -0700, you wrote:

> Mike - many congratulations! Malcolm  
> > Dear Friends & Colleagues,  
> >  
> > Thought you might be interested in this. I just found out about it  
> > today:  
> >  
> > [http://www.sciam.com/print\\_version.cfm?articleID=00052728-1BFF-1DD0-  
> > A060809EC5880106](http://www.sciam.com/print_version.cfm?articleID=00052728-1BFF-1DD0-A060809EC5880106)  
> >  
> > (go half way down the page).  
> >  
> > It will appear in the next issue of Scientific American at the  
> > newstands...  
> >  
> > mike  
> > \_\_\_\_\_  
> > \_\_\_\_\_  
> > Professor Michael E. Mann  
> > Department of Environmental Sciences, Clark Hall  
> > University of Virginia  
> > Charlottesville, VA 22903  
> > \_\_\_\_\_  
> > \_\_\_\_\_  
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> > (434) 982-2137  
> > <http://www.evsc.virginia.edu/faculty/people/mann.sht>  
> > ml  
>  
> Malcolm Hughes  
> Professor of Dendrochronology  
> Laboratory of Tree-Ring Research  
> University of Arizona  
> Tucson, AZ 85721  
> 520-621-6470  
> fax 520-621-8229

---

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Subject: From: "Michael E. Mann" <mann@virginia.edu>

Date: 11/12/02 9:45 AM

To: Malcolm Hughes <mhughes@ltrr.arizona.edu>, Ray Bradley <rbradley@geo.umass.edu>

Dear Ray, Malcolm,

Attached is the actual page from Scientific American. Our '98 Nature article (and all three authors) are recognized for the contribution...

mike

---

Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

---

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<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Attachments:

SA50.pdf 265 KB

Subject: Re:  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 11/13/02 6:35 PM  
To: Malcolm Hughes <mhughes@ltrr.arizona.edu>

HI Malcolm,

Don't think it is out just yet. We should be able to purchase copies at the newstands any day thought.

I purchased the pdf file directly from Scientific American (\$5) so can't improve upon it. However, I might have saved it at lower resolution when I extracted the page I wanted. So here is the full article as provided by Sci. American.

cheers,

mike

At 10:06 AM 11/13/2002 -0700, you wrote:

> Mike - is this actually out yet? I assume it will be in the December issue. If  
> not, I'd appreciate it if you got a chance to scan the page at a higher resolution  
> - the text in the pdf was unreadable. Cheers, Malcolm

>>

>> Dear Ray, Malcolm,

>>

>> Attached is the actual page from Scientific American. Our '98 Nature  
>> article (and all three authors) are recognized for the contribution...

>>

>> mike

>>

>>

>> Professor Michael E. Mann  
>> Department of Environmental Sciences, Clark Hall  
>> University of Virginia  
>> Charlottesville, VA 22903

>>

>>

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>> <http://www.evsc.virginia.edu/faculty/people/mann.sht>

>> ml

>

> Malcolm Hughes

> Professor of Dendrochronology

> Laboratory of Tree-Ring Research

> University of Arizona

> Tucson, AZ 85721

> 520-621-6470

> fax 520-621-8229

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Attachments:

1489207.pdf 1.2 MB

Subject: Re: EGS  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 1/15/03 11:06 AM  
To: "Raymond S. Bradley" <rbradley@geo.umass.edu>, mhughes@ltrr.arizona.edu, hfd@cdc.noaa.gov

Thanks Ray,

Yes, it is confusing the way EGS only allows you to choose between indicating "poster" or "no preference" and, to add insult to injury, doesn't allow you to indicate that your talk was solicited when you submit it. Rest assured, the talk is both 'invited' and will be an oral presentation of course...

looking forward to seeing you there...

mike

At 12:52 PM 1/15/2003 -0500, Raymond S. Bradley wrote:

> I submitted this abstract--hope you are OK with this.

> Mike--I do not want to do a poster

> ray

> CLIMATE IN MEDIEVAL TIME

>

> R. S. Bradley (1), M.K. Hughes (2), H.F. Diaz (3)

> (1) Climate System Research Center, Department of Geosciences, University of Massachusetts, Amherst (2)

Laboratory of Tree-Ring Research, University of Arizona, Tucson (3) NOAA/OAR/CDC, Boulder, Colorado.

(rbradley@geo.umass.edu/Fax: 413-545-1200)

>

> The original argument for a Medieval Warm Epoch (MWE) was made by Lamb (1965) based largely on evidence from western Europe. Much of the evidence he cited was anecdotal but he suggested that temperatures between A.D. 1000 and 1200 were about 1-2°C above present values(probably meaning the 1931-60 average). Hughes and Diaz (1994) reviewed a wide range of paleoclimatic data about the MWE, much of it reported since Lamb's classic work. They found no clear support for there having been a globally extensive warm epoch in the MWE, or indeed within a longer interval stretching from the 9th to the early 15th century. However, there is evidence for strong hydrological variability during this interval.

> What is our current understanding of the climate in Medieval time? Here, we examine recently reported data, with an emphasis on regions beyond the North Atlantic margins, and provide a summary of how climate in Medieval time may have differed from that in the 20th century.

> Hughes, M.K. and H.F. Diaz 1994. Was there a Medieval Warm Period and if so, where and when? Climatic Change 26, 109-142.

> Lamb, H.H. 1965. The early Medieval warm epoch and its sequel. Palaeogeography, Palaeoclimatology, Palaeoecology, 1, 13-37.

> its

>

> Raymond S. Bradley

> Distinguished Professor

> Director, Climate System Research Center\*

> Department of Geosciences

> Morrill Science Center

> 611 North Pleasant Street

> AMHERST, MA 01003-9297

>

> Tel: 413-545-2120

> Fax: 413-545-1200

> \*Climate System Research Center: 413-545-0659

> <<http://www.paleoclimate.org>>  
> Paleoclimatology Book Web Site: <http://www.geo.umass.edu/climate/paleo/html>  
>  
>  
>

---

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---

e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: Re: Fw: Fw: one last check  
From: Malcolm Hughes <mhughes@ltrr.arizona.edu>  
Date: 1/19/03 5:27 PM  
To: "Michael E. Mann" <mann@virginia.edu>  
CC: mhughes@ltrr.arizona.edu

Folks - one way to find someone who may have a scientific interest in this tree would be to send a query to the ITRDB forum - it's a tree-ring listserv with about 600 subscribers. You can find details of it at :

<http://web.utk.edu/~grissino/forum.htm>

Good luck!

Malcolm

> > Hi Dan, Wally:

> >  
> > I too didn't realize that these tree-rings were from so far afield (I  
> > assumed these were local too).

> >  
> > Probably not much we can do w/ them here. However, my colleague  
> > Malcolm Hughes (from Univ. Arizona) might be interested?

> >  
> > I've taken the liberty of cc'ing this to Malcolm. I hope that's ok.

> >  
> > Hope all is well out there,

> >  
> > mike

> >  
> > At 02:43 PM 1/19/2003 -0500, Dan Druckenbrod wrote:

> > Hello Wally,

> >  
> > Thanks for your reply. That remaining trunk sounds like it had an  
> > interesting history. However, when Mike had mentioned it was an  
> > oak, I just assumed we were talking about a tree from Virginia!  
> > (Its my regional bias coming through!). So, it may be that this  
> > trees final days will be spent keeping you warm via the fireplace.  
> > I'll doublecheck with Mike just to make sure, as its a shame to  
> > let any tree go, but I am almost overwhelmed in just trying to  
> > figure out how the oaks in Virginia are growing!

> >  
> > Let me know when you find yourself in Charlottesville again and  
> > I'd love to show you around the tree ring lab we have now.

> >  
> > Thanks again and hope all's well,

> > Dan

> >  
> > ----- Original Message -----

> > From: Wallace Reed  
> > To: Dan Druckenbrod  
> > Sent: Friday, January 17, 2003 6:41 PM  
> > Subject: Re: Fw: Fw: one last check

> >  
> > Dan:

> >

>> Whoa, how science proceeds! The circumstances of the oak are as  
>> follows. The remaining trunk, currently in a parking lot in front  
>> of my house has not been cored but the rings have been counted.  
>> There seem to be between 260 and 280. The tree spent most of its  
>> existence as part of an oak savanna here in Salem, Oregon. There  
>> are about 6 other similarly aged oaks within 200 feet of its  
>> former location. For the past 100 years or so, it has been part of  
>> a large farm that became a City park. For about the past 40 years,  
>> the tree has been surrounded by and embedded in a parking lot of  
>> unwashed but very compacted gravel. For about the past 20 years,  
>> an irrigation system has provided some water throughout the  
>> summer. During this past 20 years the tree has suffered some die  
>> back and has had massive mistletoe growths, some over 3 feet  
>> across. It is believed that this extra summer water was part of  
>> the cause of the tree's ill health and falling from the parking  
>> lot across the road and into my front yard on December 19, 2002.  
>> The entire root system was rotted all around the base of the  
>> trunk. All but the trunk has now been cut up, split and stacked in  
>> various locations here and elsewhere. The trunk is still here  
>> because the City of Salem does not have any way to lift it and  
>> market it as a log, but they are working on it. I do not have any  
>> coring equipment but might be able to secure some.

>> The Saga of the Tree endeth here. What's your pleasure?

>> Wally

>> At 12:15 PM 1/17/2003 -0500, you wrote:  
>> Hello Wally,

>> Mike Mann mentioned that you have recently felled some large oaks  
>> and might be willing to donate some of those to the cause of  
>> science! I've been doing alot of dendro work and may be interested  
>> in getting cross-sections or radial sections of them. But, it  
>> would be great to know where they're from as far as their approx  
>> location and setting (were they in a forest?) and whether or not  
>> you think they have >150 rings roughly. If so, they might be of  
>> interest and I'd like to talk with you further.

>> Hope all's well and thanks,

>> Dan Druckenbrod

>> ----- Original Message -----

>> From: Michael E. Mann

>> To: Dan Druckenbrod

>> Cc: mann@virginia.edu

>> Sent: Thursday, January 16, 2003 1:29 PM

>> Subject: Re: Fw: one last check

>> HI Dan,

>> Me too. Its a long time coming. It wouldn't hurt to talk to the  
>> U.Va New Office (e.g. Farris Samarai) to see if they might want to

>> do a press release on this, in advance of the Jan 22nd appearance  
>> of the article.

>> Any thoughts on this?

>> mike

>> p.s. Wally Reed called me. Apparently he felled some large oaks  
>> recently, and kept some cores and wanted to know if we might be  
>> interested. I thought the best thing to do would be to relay it to  
>> you. Please contact him if you think they might be useful. He said  
>> he'll use them for firewood if he doesn't hear back...

>> At 10:43 AM 1/14/2003 -0500, you wrote:  
>> Hi Mike,

>> Although the December issue for BAMS just came out, it sounds like  
>> our January issue isn't far down the pipeline! It should be sent  
>> out on the 22nd. I'm looking forward to seeing it!

>> Dan

>> ----- Original Message -----

>> From: "Denise Moy" <dmoy@ametsoc.org>  
>> To: "Dan Druckenbrod" <dld5k@virginia.edu>  
>> Sent: Monday, January 13, 2003 10:02 AM  
>> Subject: Re: one last check

>> > Hi Dan,

>> >  
>> > The January issue should be sent out on Jan. 22nd. We wish it  
>> could be > earlier, but catching up on our schedule has been quite  
>> a job for all of > us! I hope that you enjoy the January issue! >  
>> > Denise >> At 02:50 PM 1/11/2003 -0500, you wrote: >>Hello  
>> Denise, >> >>Just was wondering if you knew when the Jan issue  
>> of BAMS will be mailed >>out? I just saw that the December issue  
>> was posted online and I'm starting >>to get very excited as to  
>> when my article will be out! >> >>Thanks, >>Dan >>

>> \_\_\_\_\_  
>> Professor Michael E. Mann Department of  
>> Environmental Sciences, Clark Hall University of Virginia  
>> Charlottesville, VA 22903

>> \_\_\_\_\_  
>> e-mail: mann@virginia.edu Phone: (434) 924-  
>> 7770 FAX: (434) 982-2137 <http://www.evsc.virginia.edu/faculty/people/mann.shtml>

>> \_\_\_\_\_  
>> Professor Michael E. Mann  
>> Department of Environmental Sciences, Clark Hall  
>> University of Virginia  
>> Charlottesville, VA 22903

> > \_\_\_\_\_  
> > \_\_\_\_\_  
> > e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX:  
> > (434) 982-2137  
> >  
> > <http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: Re: Hockey Stick  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 1/27/03 9:34 AM  
To: steve@hemphill.net  
CC: mann@virginia.edu

Dear Mr. Hemphill,

The dependence of tree-ring paleoclimate diagnostics (annual growth width and early and latewood density) and the varying combinations of seasonal thermal and hydrological influences they represent, and how best to separate such influences in the paleoclimate reconstruction problem, have been studied for decades. Very few investigators active investigators aren't both well aware of these issues, and quite careful to take them into account in their work.

There is, of course, a vast literature on this predating our own work, and the IPCC report (chapter 2) is a good place to start in terms of references to the peer-reviewed literature.

The nature of co2 fertilization effects remains far more controversial, although there is some support for the presence of such an effect, in particular, for drought-stressed high elevation conifers. Where such effects indeed appear to exist, they have been taken into account (see e.g. Mann et al, 1999 for a discussion).

If you're interested in learning more about the science of tree-ring research, you should contact Malcolm Hughes (mhughes@ltrr.arizona.edu), former director the Laboratory for Tree Ring Research (LTRR) at the University of Arizona, who teaches a summer course on this topic for non-specialists.

I hope you find the above information helpful. Owing to pressures on my time, I unfortunately will be unable to respond to any further inquiries.

Best of luck with your endeavors.

Sincerely,

Michael E. Mann

At 09:28 AM 1/27/2003 -0700, you wrote:

> Dr. Mann,

>

> I have a quick question for you on your "Hockey Stick" representation of temperature.

>

> How do you differentiate between precipitation, temperature, and CO2 fertilization when analyzing tree rings, and do you have a link to a reference on that?

>

> Thank you very much,

> Steve Hemphill

>

---

Professor Michael E. Mann  
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University of Virginia  
Charlottesville, VA 22903

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e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: Re: Preprint  
From: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>  
Date: 2/13/03 8:25 AM  
To: Volker Rath <volker@geophysik.rwth-aachen.de>  
CC: mann@virginia.edu

Dear Volker,

I haven't see what Henry has written, but our manuscript should speak for itself...

The preprint of the paper

Mann, M.E., Rutherford, S., Bradley, R.S., Hughes, M.K., Keimig, F.T., Optimal Surface Temperature Reconstructions using Terrestrial Borehole Data, Journal of Geophysical Research, in press, 2003

is available as a pdf file here:

<ftp://holocene.evsc.virginia.edu/pub/mann/Borehole-preprint02.pdf>

Thanks for your interest in our work. Look forward to meeting you in Nice,

Mike Mann

At 04:06 PM 2/13/03 +0100, you wrote:

> Dear Michael,  
> is it possible to get a (digital) preprint of your forthcoming paper  
> Optimal surface temoerature reconstructions using terrestrial borehole data, JGR D, 2003  
> mentioned in Henry Pollacks contribution to EGS 2003? The journal is not accessible in our university.  
> Looking forward to meet you at Nice,  
> Volker Rath  
>  
> --  
> Dr. Volker Rath  
> Angewandte Geophysik  
> Aachen University of Technology (RWTH)  
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> <http://www-users.rwth-aachen.de/volker.rath>  
>

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Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
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e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: Re: JGR Borehole data posted on Paleo website  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 4/3/03 1:58 PM  
To: Bruce A Bauer <Bruce.A.Bauer@noaa.gov>, Scott Rutherford <srutherford@gso.uri.edu>  
CC: Mark.Eakin@noaa.gov, mhughes@ltrr.arizona.edu, rbradley@geo.umass.edu, frank@geo.umass.edu

Thanks a bunch Bruce,

This looks great, and I really appreciate the effort. We hope that this paper will move the debate in a useful direction.

best regards,

mike

At 12:57 PM 4/3/2003 -0700, Bruce A Bauer wrote:

> Dear Mike and Scott,

> Congrats on the publication of the JGR borehole paper, and thanks again for contributing the the data files. I have now posted the data and and a web page feature at:

> <http://www.ngdc.noaa.gov/paleo/pubs/mann2003/mann2003.html>

> I have added links on our site from the What's New and Borehole data pages as well, so I wouldn't expect anyone to have trouble finding it despite the lack of a detailed URL in the JGR paper.

>

> If you have any suggestions, please let me know!

> Cheers, Bruce

>

> At 05:41 PM 4/2/2003 -0500, you wrote:

>> Dear Bruce,

>>

>> The paper is out in the latest JGR (I've attached the pdf file):

>>

>> Mann, M.E., Rutherford, S., Bradley, R.S., Hughes, M.K., Keimig, F.T., Optimal Surface Temperature Reconstructions using Terrestrial Borehole Data, Journal of Geophysical Research, 108 (D7), 4203, doi: 10.1029/2002JD002532, 2003

>>

>> Due to an unfortunate oversight, neither of these two references made it into the final draft of the manuscript:

>>

>> <http://www.ngdc.noaa.gov/paleo/borehole/borehole.html>

>> <http://www.ngdc.noaa.gov/paleo/pubs/mann2003/>

>>

>> but there is a reference to [www.ngdc.noaa.gov/paleo/paleo.html](http://www.ngdc.noaa.gov/paleo/paleo.html) for the raw borehole data, so hopefully people can find everything (the raw data, our optimal reconstruction, and the associated "what's new" link) from the main paleo webpage.

>>

>> Scott should be able to provide you guys w/ any of the data that he hasn't already.

>>

>> Thanks for your help, and please let me know if there is anything further I can do to help out.

>>

>> best regards,

>>

>> mike

>

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<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: Fwd: New Report: Lessons and Limits of Climate History  
From: "Raymond S. Bradley" <rbradley@geo.umass.edu>  
Date: 4/18/03 11:42 AM  
To: mhughes@ltrr.arizona.edu, mann@multiproxy.evsc.virginia.edu

> X-Sender: anrevk@smtp-store.nytimes.com  
> X-Mailer: QUALCOMM Windows Eudora Pro Version 4.2.2  
> Date: Fri, 18 Apr 2003 12:30:02 -0400  
> To: rbradley@geo.umass.edu  
> From: Andy Revkin <anrevk@nytimes.com>  
> Subject: Fwd: New Report: Lessons and Limits of Climate History  
>  
> can you forward this to michael m?  
> my emails to him bounce back. thanks!  
>  
> the latest effort by the Right to communicate the soon-baliunas analysis....  
>  
>

>> X-Sender: walear@smtp-store.nytimes.com  
>> X-Mailer: QUALCOMM Windows Eudora Pro Version 4.2.2  
>> Date: Fri, 18 Apr 2003 12:14:53 -0400  
>> To: anrevk@nytimes.com  
>> From: Warren Leary <wleary@nytimes.com>  
>> Subject: Fwd: New Report: Lessons and Limits of Climate History  
>>  
>> So much for global warming! Think I'll go outside and release some fluorocarbons.  
>> Warren  
>>  
>>

>>> From: "George C. Marshall Institute" <info@marshall.org>  
>>> To: "Mailing List" <info@marshall.org>  
>>> Subject: New Report: Lessons and Limits of Climate History  
>>> Date: Fri, 18 Apr 2003 12:07:56 -0400  
>>> X-Mailer: Microsoft Outlook Express 6.00.2720.3000  
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xml:namespace prefix = o ns = "urn:schemas-microsoft-com:office:office" />

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>>> 20TH CENTURY TEMPERATURE TRENDS NOT  
>>> UNUSUAL, FINDS MARSHALL INSTITUTE REPORT  
>>>

>>> The Marshall Institute today released a report, Lessons and Limits of Climate History: Was the 20th Century Climate Unusual?, (found at <<http://www.marshall.org/pdf/materials/136.pdf>><http://www.marshall.org/pdf/materials/136.pdf>) showing that the temperature record of the late 20th century was not remarkable relative to that of the past 1,000 years. The report, authored by the Marshall Institute's Senior Scientists Willie Soon and Sallie Baliunas, challenges frequently made claims that the 20th century was warmer than any other in the millennium, that

the 1990s were the warmest decade of the millennium, and that 1998 was the warmest year in the past 1,000 years.

>>>

>>>

>>>

>>> "Advocates who claim that human activity will cause serious climate change often attempt to bolster their arguments by drawing on a reconstructed record of the past 1,000 years," Jeff Kueter, Marshall Institute Executive Director, said. "This report clearly reveals the limitations and uncertainties of reconstructing past temperature records."

>>>

>>>

>>>

>>> After reviewing more than 200 climate studies, the report concludes that the temperature record for the past 1,000 years is far too incomplete and uncertain to support such definitive conclusions about the 20th century, any decade in it, and especially any given year -- the 20th century is neither the warmest century nor the century with the most extreme weather of the past 1,000 years. To judge the validity of claims about long-term temperature trends, it is first necessary to judge whether the reconstructed climate history is sufficiently accurate for making comparisons with the 20th century. The study reviews the nature and quality of direct temperature measures since the latter half of the 19th century. That record consists of data from the direct measurement of surface temperature since the 1860s.

Measurements for the remaining 900 years rely on proxy data drawn from tree rings, coral reefs, ocean sediments, ice cores and bore holes in the earth's surface and glacier movements, from which information about temperature can only be inferred. The study then reviews the range of temperature proxies that exist for the earlier period of almost 900 years and

>>>

>>> discusses both their value and limits.

>>>

>>> The examination of the available climate data and proxies lead to the following

>>>

>>> observations:

>>>

>>>

>>>

>>> " There was a worldwide Medieval Warm Period that lasted from the 9th to the 14th century which was followed by a worldwide Little Ice Age that lasted from 1400 to 1900.

>>>

>>>

>>>

>>> " Global surface temperature rose during the 20th century, in part due to recovery from the Little Ice Age.

>>>

>>>

>>>

>>> " Although the 1990s were the warmest in the 140 year period of direct temperature measurements, there were 50-year periods in the past millennium that were warmer than any 50-year periods in the 20th century.

>>>

>>>

>>>

>>> " There is no convincing evidence that the 20th century was "unusual." On balance, the evidence indicates that the 20th century falls within the range experienced during the past 1,000 years.

>>>

>>>

>>>

>>> "The lesson from this review is the importance of understanding the limits of available data and not pushing data beyond those limits," William O'Keefe, President of the Marshall Institute, said. "The report clearly shows that claims that we are observing a warming unlike anything in the past 1,000 years are a triumph of assumption over scientific evidence."



Subject: Fwd: so, what's new...

From: "Raymond S. Bradley" <rbradley@geo.umass.edu>

Date: 4/18/03 7:34 AM

To: mann@multiproxy.evsc.virginia.edu, mhughes@ltrr.arizona.edu, frank@geo.umass.edu

>

> April 18, 2003

>

> Rejecting the World

>

> By PAUL KRUGMAN,

>

> The Bush administration did the right thing on diesel emissions this week, curbing an important source of air pollution. Yet George Bush has, in general, reneged on the environmental promises of his 2000 campaign. Most notably, he broke his campaign pledge to regulate carbon dioxide emissions, offering instead a purely voluntary -- and therefore, one might have thought, meaningless -- plan to limit global warming.

>

> But even this, it turns out, was too much for Mr. Bush's party. The energy bill passed by House Republicans last week didn't include any plan, even a voluntary one, to limit greenhouse emissions. Why?

>

> The answer, I believe, has to do with an aversion to all things global.

>

> On its face, the Bush plan on global warming was a sham, relying on the kindness of corporations. The Department of Energy would have issued credits to companies that reduced carbon dioxide emissions, but since there would have been no legal limits, those credits would simply have been a symbolic recognition of good behavior.

>

> Or would they? Right-wing think tanks engaged in a concerted, and successful, campaign to persuade Congress to reject the Bush scheme. Those think tanks argued that keeping track of emission reductions would make it easier for a future administration to introduce a real global warming policy: companies that had accumulated credits might favor measures that gave those credits some value. More broadly, they opposed any legitimization of the idea that global warming is a problem.

>

> But why would that be such a bad thing, from their point of view?

>

> We can safely dismiss the idea that the right has carefully weighed the scientific evidence and concluded that the overwhelming consensus of the scientific community is wrong. We can also dismiss the idea that conservatives have carefully examined the economics of emission controls and concluded that they are too expensive.

>

> So was it just politics as usual? Opposition to a global warming policy partly reflects a general aversion to government regulation. Don't forget that Tom DeLay, the House majority leader, is a former exterminator who entered politics because he was angry about controls on pesticide use.

>

> But the ferocity with which the right opposes any policy to limit greenhouse gases, even the nearly empty Bush plan, goes beyond general anti-environmentalism. What's different about global warming, I think, is that unlike local pollution, dealing with it requires concerted action by governments around the world. And that's what the right really can't stand.

>

> This shouldn't be surprising. There was a time when U.S. conservatives were isolationists. Nobody thinks that's a viable position nowadays, but the same impulses -- an assertion of moral superiority, an unwillingness to consider alternative points of view -- lie behind America's new spirit of unilateralism. We obviously can't ignore the world, but many Americans reject the idea that other countries should have any say over what we do.

>

> But what happens when unilateralists encounter problems that clearly require the cooperation of other countries -- not as junior partners, but as equals? Right now the answer is simply to deny the existence of those problems. The greenhouse effect is a quintessentially global issue -- fine, we'll deny that global warming exists. Fighting stateless terrorists demands a global cooperative effort -- fine, we'll fight terrorism by launching a conventional war against a regime that, nasty as it was, had nothing to do with the terrorist attacks.

>

> Eventually, of course -- and sooner rather than later -- this attempt to deny reality will fail. While we've been watching the Iraq show, many past achievements of U.S. foreign policy have been disintegrating. Through neglect and arrogance, the United States has squandered the good will it built up in Latin America in the 1990's. For half a century the U.S. has regarded the drive toward free trade as a key part of its global strategy; now trade negotiations are falling apart from lack of attention.

>

> Even in Iraq, we're starting to see that winning the war was the easy part, and U.S. officials -- previously dismissive of "old Europe" -- are suddenly talking about an international peacekeeping force. But to be effective, such a force, like the one in Afghanistan, would surely have to include French and German soldiers.

>

> The truth is that we can't go it alone. But by the time that truth sinks in, there may be a lot of pieces to pick up.

>

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>

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<<http://www.paleoclimate.org>>

Paleoclimatology Book Web Site: <http://www.geo.umass.edu/climate/paleo/html>

Subject: seen this?

From: "Raymond S. Bradley" <rbradley@geo.umass.edu>

Date: 4/27/03 6:18 AM

To: mann@multiproxy.evsc.virginia.edu, mhughes@ltrr.arizona.edu, srutherford@virginia.edu

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[168\\_%2810\\_June\\_2003%29%2BMEvaluation,\\_Intercomparison\\_and\\_Application\\_of\\_Global\\_Climate\\_Models%2BMEvaluated\\_by\\_P.B.\\_Duffy%23tagged%23Volume%23first%3D37%23Issues%23first%3D1%23last%3D2%23spans%3D2%23Pages%23first%3D1%23last%3D168%23date%23%2810\\_June\\_2003%29%23specisname%23Evaluation,\\_Intercomparison\\_and\\_Application\\_of\\_Global\\_Climate\\_Models%23speciseditor%23Edited\\_by\\_P.B.\\_Duffy%23&\\_auth=y&\\_view=c&\\_acct=C000050221&\\_version=1&\\_urlVersion=0&\\_userid=10&md5=4d6a6273ebae7d44cafd3dc86e13616](http://www.sciencedirect.com/science?_ob=IssueURL&_tockey=%23TOC%235996%232003%23999629998%23422719%23FLA%23display%23Volume_37,_Issues_1-2,_Pages_1-168_%2810_June_2003%29%2BMEvaluation,_Intercomparison_and_Application_of_Global_Climate_Models%2BMEvaluated_by_P.B._Duffy%23tagged%23Volume%23first%3D37%23Issues%23first%3D1%23last%3D2%23spans%3D2%23Pages%23first%3D1%23last%3D168%23date%23%2810_June_2003%29%23specisname%23Evaluation,_Intercomparison_and_Application_of_Global_Climate_Models%23speciseditor%23Edited_by_P.B._Duffy%23&_auth=y&_view=c&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=4d6a6273ebae7d44cafd3dc86e13616)>Volume 37, Issues 1-2 , 10 June 2003, Pages 19-32

Evaluation, Intercomparison and Application of Global Climate Models

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Evaluation of Northern Hemisphere natural climate variability in multiple temperature reconstructions and global climate model simulations

J. L. Bell<[http://www.sciencedirect.com/science?\\_ob=ArticleURL&\\_udi=B6VF0-47JCPR8-](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VF0-47JCPR8-1&_coverDate=06%2F10%2F2003&_alid=88346423&_rdoc=1&_fmt=&_orig=search&_qd=1&_cdi=5996&_sort=d&_view=c&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=015a8dfd5f8e5776fee713731c26f719#af)

[1&\\_coverDate=06%2F10%2F2003&\\_alid=88346423&\\_rdoc=1&\\_fmt=&\\_orig=search&\\_qd=1&\\_cdi=5996&\\_sort=d&\\_view=c&\\_acct=C000050221&\\_version=1&\\_urlVersion=0&\\_userid=10&md5=015a8dfd5f8e5776fee713731c26f719#af](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VF0-47JCPR8-1&_coverDate=06%2F10%2F2003&_alid=88346423&_rdoc=1&_fmt=&_orig=search&_qd=1&_cdi=5996&_sort=d&_view=c&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=015a8dfd5f8e5776fee713731c26f719#af)

f1>a, <[http://www.sciencedirect.com/science?\\_ob=ArticleURL&\\_udi=B6VF0-47JCPR8-1&\\_coverDate=06%2F10%2F2003&\\_alid=88346423&\\_rdoc=1&\\_fmt=&\\_orig=search&\\_qd=1&\\_cdi=5996&\\_sort=d&view=c&\\_acct=C000050221&\\_version=1&\\_urlVersion=0&\\_userid=10&md5=015a8dfd5f8e5776fee713731c26f719#m4.cor\\*](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VF0-47JCPR8-1&_coverDate=06%2F10%2F2003&_alid=88346423&_rdoc=1&_fmt=&_orig=search&_qd=1&_cdi=5996&_sort=d&view=c&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=015a8dfd5f8e5776fee713731c26f719#m4.cor*)>220d1a.jpg, <<mailto:jbelle@es.ucsc.edu>>220d29.jpg, L. C. Sloan<[http://www.sciencedirect.com/science?\\_ob=ArticleURL&\\_udi=B6VF0-47JCPR8-1&\\_coverDate=06%2F10%2F2003&\\_alid=88346423&\\_rdoc=1&\\_fmt=&\\_orig=search&\\_qd=1&\\_cdi=5996&\\_sort=d&view=c&\\_acct=C000050221&\\_version=1&\\_urlVersion=0&\\_userid=10&md5=015a8dfd5f8e5776fee713731c26f719#af](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VF0-47JCPR8-1&_coverDate=06%2F10%2F2003&_alid=88346423&_rdoc=1&_fmt=&_orig=search&_qd=1&_cdi=5996&_sort=d&view=c&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=015a8dfd5f8e5776fee713731c26f719#af)>a, J. Revenaugh<[http://www.sciencedirect.com/science?\\_ob=ArticleURL&\\_udi=B6VF0-47JCPR8-1&\\_coverDate=06%2F10%2F2003&\\_alid=88346423&\\_rdoc=1&\\_fmt=&\\_orig=search&\\_qd=1&\\_cdi=5996&\\_sort=d&view=c&\\_acct=C000050221&\\_version=1&\\_urlVersion=0&\\_userid=10&md5=015a8dfd5f8e5776fee713731c26f719#af](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VF0-47JCPR8-1&_coverDate=06%2F10%2F2003&_alid=88346423&_rdoc=1&_fmt=&_orig=search&_qd=1&_cdi=5996&_sort=d&view=c&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=015a8dfd5f8e5776fee713731c26f719#af)>a and P. B. Duffy<[http://www.sciencedirect.com/science?\\_ob=ArticleURL&\\_udi=B6VF0-47JCPR8-1&\\_coverDate=06%2F10%2F2003&\\_alid=88346423&\\_rdoc=1&\\_fmt=&\\_orig=search&\\_qd=1&\\_cdi=5996&\\_sort=d&view=c&\\_acct=C000050221&\\_version=1&\\_urlVersion=0&\\_userid=10&md5=015a8dfd5f8e5776fee713731c26f719#af](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VF0-47JCPR8-1&_coverDate=06%2F10%2F2003&_alid=88346423&_rdoc=1&_fmt=&_orig=search&_qd=1&_cdi=5996&_sort=d&view=c&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=015a8dfd5f8e5776fee713731c26f719#af)>b

a Department of Earth Sciences, University of California, Santa Cruz, CA 95064, USA

b Climate and Carbon Cycle Modeling Group, Lawrence Livermore National Laboratory, Livermore, CA 94550, USA

Received 1 April 2001; accepted 6 July 2002. ; Available online 28 December 2002.

## Abstract

The detection of anthropogenic climate change in observations and the validation of climate models both rely on understanding natural climate variability. To evaluate internal climate variability, we apply spectral analysis to time series of surface air temperature (SAT) from nine coupled general circulation model (GCM) simulations, three recent global paleotemperature reconstructions, and Northern Hemisphere (NH) instrumental records. Our comparison is focused on the NH due to the greater spatial and temporal coverage and validation of the available NH temperature reconstructions. The paleotemperature reconstructions capture the general magnitude of NH climate variability, but not the precise variance and specific spatial, temporal, or periodic signals demonstrated in the instrumental record. The models achieved varying degrees of success for each measure of variability analyzed, with none of the models consistently capturing the appropriate variability. In general, the models performed best in the analysis of combined mean annual land and marine variability

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\*Climate System Research Center: 413-545-0659

<<http://www.paleoclimate.org>>

Paleoclimatology Book Web Site: <http://www.geo.umass.edu/climate/paleo/html>

Attachments:

220c6e.jpg  
220c9d.jpg  
220cbc.jpg  
220ccc.jpg  
220cdb.jpg  
220ceb.jpg  
220cfa.jpg  
220d0a.jpg  
220d1a.jpg  
220d29.jpg

Subject: FYI

From: "Michael E. Mann" <mann@virginia.edu>

Date: 5/20/03 8:09 AM

To: rbradley@geo.umass.edu, tom crowley <tom@ocean.tamu.edu>, p.jones@uea.ac.uk, mhughes@ltrr.arizona.edu, jto@u.arizona.edu, michael Oppenheimer <omichael@princeton.edu>

CC: mann@virginia.edu

>

>

> "Catanzaro, Michael (EPW)" <Michael\_Catanzaro@epw.senate.gov> on 05/19/2003

> 07:00:09 PM

>

>

> To: "Catanzaro, Michael (EPW)" <Michael\_Catanzaro@epw.senate.gov>

> cc:

> bcc:

>

>

> Subject: EPW: CLIMATE CHANGE

>

>

> THE SCIENCE OF CLIMATE CHANGE

>

> An excerpt from the Competitive Enterprise Institute on the

> "hockey stick theory" of global warming:

>

> "The main propaganda device of the [United Nations Third  
> Assessment Report on climate change] is the 'hockey stick graph.' The  
> graph is a temperature record derived from tree rings dating back to 1000  
> AD and running through 1900, with the 20th century thermometer-based  
> temperature data attached at the end. It claims to show that global  
> temperatures have remained steady or even decreased during the last  
> millennium until the industrial age, when there was an anomalous warming  
> represented by the blade of the hockey stick. The hockey stick is largely  
> bogus, however. The margin of error is so large that nearly any  
> temperature trend could be drawn to fit within it.

>

> "Global warming alarmists use the hockey stick to claim that  
> current warming is greater than at any other time in the last 1,000 years.  
> The Medieval Warm Period (MWP) and the Little Ice Age (LIA) were two  
> naturally occurring events during the last millennium where the range of  
> global temperature change exceeded that of the 20th century. During the  
> MWP, global temperatures were higher than they are today. The MWP,  
> however, does not show up in the hockey stick graph.

>

> "The hockey stick theory has effectively been dismantled by,  
> among others, Dr. Sallie Baliunas and Dr. Willie Soon of Harvard in their  
> recently published meta-analysis of 240 peer-reviewed climate studies.  
> Also, Wallace Broecker, of the Lamont-Doherty Earth Observatory, argued in  
> Science magazine that the MWP and the LIA were indeed global phenomena.  
> Referring to the hockey stick, Broecker notes, 'A recent, widely cited  
> reconstruction leaves the impression that the 20th century warming was  
> unique during the last millennium. It shows no hint of the Medieval Warm

- > Period (from around 800 to 1200 A.D.) during which the Vikings colonized
- > Greenland, suggesting that this warm event was regional rather than global.
- > It also remains unclear why just at the dawn of the Industrial Revolution
- > and before the emission of substantial amounts of anthropogenic [manmade]
- > greenhouse gases, Earth's temperature began to rise steeply."

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Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

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e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: Globe  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 5/21/03 5:45 AM  
To: mhughes@ltrr.arizona.edu, trenbert@ncar.ucar.edu  
CC: rbradley@geo.umass.edu, mann@virginia.edu

Kevin, Malcolm:

This piece appeared in the globe yesterday:

[http://www.boston.com/dailyglobe2/140/science/Coaxing\\_nature\\_to\\_reveal\\_1\\_000\\_years\\_of\\_the\\_Earth\\_s\\_climate+.html](http://www.boston.com/dailyglobe2/140/science/Coaxing_nature_to_reveal_1_000_years_of_the_Earth_s_climate+.html)

The piece seemed inappropriately uncritical given the emphasis of the story on Soon/Baliunas, and I'm wondering if the reporter adequately represented your comments and views in the piece,

mike

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Professor Michael E. Mann  
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<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: Piece in todays 'Atlanta Journal Constitution'  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 5/31/03 8:07 AM  
To: mann@virginia.edu

Dear Friends and Colleagues,

I thought you might be interested in this article, which addresses the Soon & Baliunas matter:

<http://www.ajc.com/business/content/business/0603/01warming.html>

A piece along similar lines should be appearing in next month's "Scientific American".

best regards,

mike mann

---

Professor Michael E. Mann  
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e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: another article...  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 6/2/03 5:42 AM  
To: mann@virginia.edu

FYI,

[http://seattlepi.nwsourc.com/national/124642\\_warming02.html](http://seattlepi.nwsourc.com/national/124642_warming02.html)

Mike

---

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<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: FYI  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 6/2/03 1:51 PM  
To: mann@virginia.edu

<http://www.heatisonline.org/contentserver/objecthandlers/index.cfm?id=4309&method=full>

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<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: From the New York Times today-see para 6

From: "Raymond S. Bradley" <rbradley@geo.umass.edu>

Date: 6/19/03 6:33 AM

To: tcrowley@duke.edu, Kevin Trenberth <trenbert@cgd.ucar.edu>, "Michael E. Mann" <mann@virginia.edu>, Keith Briffa <k.briffa@uea.ac.uk>, Caspar Ammann <ammann@ucar.edu>, wigley@ncar.ucar.edu, jto@u.arizona.edu, Tim Osborn <t.osborn@uea.ac.uk>, p.jones@uea.ac.uk, henry.f.diaz@noaa.gov, mhughes@ltrr.arizona.edu, frank@geo.umass.edu, bradbury@geo.umass.edu, appell@nasw.org, apetsonk@environmentaldefense.org, omichael@Princeton.EDU

Report by the E.P.A. Leaves Out Data on Climate Change

By ANDREW C. REVKIN with KATHARINE Q. SEELYE

adaaf.jpghe Environmental Protection Agency is preparing to publish a draft report next week on the state of the environment, but after editing by the White House, a long section describing risks from rising global temperatures has been whittled to a few noncommittal paragraphs.

The report, commissioned in 2001 by the agency's administrator, Christie Whitman, was intended to provide the first comprehensive review of what is known about various environmental problems, where gaps in understanding exist and how to fill them.

Agency officials said it was tentatively scheduled to be released early next week, before Mrs. Whitman steps down on June 27, ending a troubled time in office that often put her at odds with President Bush.

Drafts of the climate section, with changes sought by the White House, were given to The New York Times yesterday by a former E.P.A. official, along with earlier drafts and an internal memorandum in which some officials protested the changes. Two agency officials, speaking on the condition of anonymity, said the documents were authentic.

The editing eliminated references to many studies concluding that warming is at least partly caused by rising concentrations of smokestack and tail-pipe emissions and could threaten health and ecosystems.

Among the deletions were conclusions about the likely human contribution to warming from a 2001 report on climate by the National Research Council that the White House had commissioned and that President Bush had endorsed in speeches that year. White House officials also deleted a reference to a 1999 study showing that global temperatures had risen sharply in the previous decade compared with the last 1,000 years. In its place, administration officials added a reference to a new study, partly financed by the American Petroleum Institute, questioning that conclusion

In the end, E.P.A. staff members, after discussions with administration officials, said they decided to delete the entire discussion to avoid criticism that they were selectively filtering science to suit policy.

Administration officials defended the report and said there was nothing untoward about the process that produced it. Mrs. Whitman said that she was "perfectly comfortable" with the edited version and that the differences over climate change should not hold up the broader assessment of the nation's air, land and water.

"The first draft, as with many first drafts, contained everything," she said in a brief telephone interview from the CBS studios in Manhattan, where she was waiting to tape "The Late Show With David Letterman."

"As it went through the review, there was less consensus on the science and conclusions on climate change," Ms. Whitman said. "So rather than go out with something half-baked or not put out the whole report, we felt it was important for us to get this out because there is a lot of really good information that people can use to measure our successes."

James L. Connaughton, chairman of the Council on Environmental Quality, a White House advisory group, said, "It would be utterly inaccurate to suggest that this administration has not provided quite an extensive discussion about the state of the climate. Ultimately, E.P.A. made the decision not to include the section on climate change because we had these ample discussions of the subject already."

But private environmental groups sharply criticized the changes when they heard of them.

"Political staff are becoming increasingly bold in forcing agency officials to endorse junk science," said Jeremy Symons, a climate policy expert at the National Wildlife Federation. "This is like the White House directing the secretary of labor to alter unemployment data to paint a rosy economic picture."

Drafts of the report have been circulating for months, but a heavy round of rewriting and cutting by White House officials in late April raised protest among E.P.A. officials working on the report.

An April 29 memorandum circulated among staff members said that after the changes by White House officials, the section on climate "no longer accurately represents scientific consensus on climate change."

Another memorandum circulated at the same time said that the easiest course would be to accept the White House revisions but that to do so would taint the agency, because "E.P.A. will take responsibility and severe criticism from the science and environmental communities for poorly representing the science."

The changes were mainly made by the Council on Environmental Quality, although the Office of Management and Budget was also involved, several E.P.A. officials said. It is the second time in a year that the White House has sought to play down global warming in official documents.

Last September, an annual E.P.A. report on air pollution that for six years had contained a section on climate was released without one, and the decision to delete it was made by Bush administration appointees at the agency with White House approval.

Like the September report, the forthcoming report says the issues will be dealt with later by a climate research plan being prepared by the Bush administration.

Other sections of the coming E.P.A. report on water quality, ecological conditions, ozone depletion in the atmosphere and other issues all start with a summary statement about the potential impact of changes on human health and the environment, which are the two responsibilities of the agency.

But in the "Global Issues" section of the draft returned by the White House to E.P.A. in April, an introductory sentence reading, "Climate change has global consequences for human health and the environment" was cut and replaced with a paragraph that starts: "The complexity of the Earth system and the interconnections among its components make it a scientific challenge to document change, diagnose its causes, and develop useful projections of how natural variability and human actions may affect the global environment in the future."

Some E.P.A. staff members defended the document, saying that although pared down it would still help policy makers and the agency address the climate issue.

"This is a positive step by the agency," said an author of the report, who did not want to be named, adding that it would help someone determine "if a facility or pollutant is going to hurt my family or make it bad for the birds, bees and fish out there."

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\*Climate System Research Center: 413-545-0659

<<http://www.paleoclimate.org>>

Paleoclimatology Book Web Site: <http://www.geo.umass.edu/climate/paleo/html>

Attachments:

adaaf.jpg

Subject: Sci Am piece  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 6/25/03 9:57 AM  
To: Raymond Bradley <rbradley@geo.umass.edu>, Phil Jones <p.jones@uea.ac.uk>, Malcolm Hughes <mhughes@lrr.arizona.edu>

Hi Ray/Phil/Malcolm,

I trust you've all seen this (appears in print in August issue). Worth passing along to folks who have been following this business,

Malcolm: I really like your quote!

Off to Japan now (one two many Mai Tai's last night),

cheers,

mike

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Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

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<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Attachments:

SciAmJune03-Appell.pdf 126 KB

SciAmJune03-Appell-sidebar.pdf 189 KB

Subject: Fwd: Re: new scientist magazine  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 6/26/03 2:22 PM  
To: pearcefred <PEARCEFRED@compuserve.com>  
CC: p.jones@uea.ac.uk, mann@virginia.edu, Tim Osborn <t.osborn@uea.ac.uk>, Malcolm Hughes <mhughes@lrr.arizona.edu>, Raymond Bradley <rbradley@geo.umass.edu>, Keith Briffa <k.briffa@uea.ac.uk>

Hi Fred,

It appears that the "Eos" piece will appear sooner than I thought (July 8th issue), and Phil Jones and I may both still be travelling.

You might want to get in touch with Tim Osborn, Keith Briffa, Malcolm Hughes, or Ray Bradley in the meantime--Tim has been in touch w/ AGU lately, and can probably get some information regarding embargo policies, as well as updates on the actual date the piece is set to appear.

I may be unreachable in Japan (I happen to have a good email connection in Tokyo today, but this may be the last time).

Thanks again for your interest in the piece,

mike

> Date: Thu, 26 Jun 2003 17:11:56 -0400  
> To: pearcefred <PEARCEFRED@compuserve.com>  
> From: "Michael E. Mann" <mann@virginia.edu>  
> Subject: Re: new scientist magazine  
> Cc: p.jones@uea.ac.uk, mann@virginia.edu

>

> HI Fred,

>

> Thanks much for your message.

>

> I'd be honoured if you would be interested in doing a story on this at New Scientist.

>

> I'm going to be travelling for the next two weeks or so (on my honeymoon right now, in fact, in Japan), but you can also get some information from Phil Jones.

>

> We still need to check with AGU regarding embargo policies, etc., so it would probably be premature at this point to publish a story, but certainly it wouldn't be too early to begin putting the story together, and I'd be happy for you to quote from either or both papers in the process.

>

> The two articles should appear in roughly 1 month or so, I believe, I can update you as soon as I have any additional information from AGU and from Harvey Leiffert (AGU's press person).

>

> Please let me know if there is any way I can help out in the meantime.

>

> Thanks again for your interest,

>

> mike

>

> At 04:36 AM 6/26/2003 -0400, you wrote:

>> Michael,

>> Mark Lynas has passed to me you two upcoming papers contradicting Willie

>> Soon's recent stuff on temperature history. We at New Scientist would like  
>> to do a short news story. Should we wait till one of the papers is  
>> published (if so, when will that be?), or can we go ahead with a story now?  
>> If so, can we quote from one of the papers with your permission? Or would  
>> you like to give us some of your own quotes for publication?  
>> Regards  
>> Fred Pearce  
>> New Scientist  
>> London

>

>

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> Professor Michael E. Mann  
> Department of Environmental Sciences, Clark Hall  
> University of Virginia  
> Charlottesville, VA 22903

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> <http://www.evsc.virginia.edu/faculty/people/mann.shtml>

>

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<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: From August 'Discover' magazine (just out)

From: "Michael E. Mann" <mann@virginia.edu>

Date: 7/17/03 3:17 PM

To: rbradley@geo.umass.edu, mhughes@ltr.arizona.edu, Michael Oppenheimer <omichael@princeton.edu>, Mike MacCracken <mmaccrac@comcast.net>, Keith Briffa <k.briffa@uea.ac.uk>, Tim Osborn <t.osborn@uea.ac.uk>, Phil Jones <p.jones@uea.ac.uk>, Ellen Mosley-Thompson <thompson.4@osu.edu>, Eric Steig <steig@ess.washington.edu>, Gavin Schmidt <gschmidt@giss.nasa.gov>, Scott Rutherford <srutherford@gso.uri.edu>, Mike Hulme <m.hulme@uea.ac.uk>

[http://www.discover.com/aug\\_03/breakhot.html](http://www.discover.com/aug_03/breakhot.html)

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<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Attachments:

DiscoverSoonetalAug03.pdf 100 KB

Subject: re boreholes  
From: "Raymond S. Bradley" <rbradley@geo.umass.edu>  
Date: 7/17/03 12:04 PM  
To: mann@multiproxy.evsc.virginia.edu, srutherford@virginia.edu, mhughes@ltrr.arizona.edu

The role of snow cover in the warming of arctic permafrost  
Marc Stieglitz,<sup>1</sup> S. J. DeÁry,<sup>1</sup> V. E. Romanovsky,<sup>2</sup> and T. E. Osterkamp<sup>2</sup>  
GEOPHYSICAL RESEARCH LETTERS, VOL. 30, NO. 13, 1721, doi:10.1029/2003GL017337, 2003

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\*Climate System Research Center: 413-545-0659

<<http://www.paleoclimate.org>>

Paleoclimatology Book Web Site: <http://www.geo.umass.edu/climate/paleo/html>

Subject: Re: From August 'Discover' magazine (just out)

From: "Michael E. Mann" <mann@virginia.edu>

Date: 7/17/03 5:18 PM

To: mcarey@environmentaldefense.org

CC: Gavin Schmidt <gschmidt@giss.nasa.gov>, Keith Briffa <k.briffa@uea.ac.uk>, mhughes@ltrr.arizona.edu, Mike MacCracken <mmacrac@comcast.net>, Mike Hulme <m.hulme@uea.ac.uk>, Michael Oppenheimer <omichael@princeton.edu>, Phil Jones <p.jones@uea.ac.uk>, rbradley@geo.umass.edu, Scott Rutherford <srutherford@gso.uri.edu>, Eric Steig <steig@ess.washington.edu>, Ellen Mosley-Thompson <thompson.4@osu.edu>, Tim Osborn <t.osborn@uea.ac.uk>

Thanks Melissa,

Indeed. It is thus very encouraging that Discover Magazine (the \*print\* version, August issue, rather than just the "online" version) has now published a very different viewpoint of the Soon et al paper, as indicated in the online link I provided...

best regards,

mike

At 07:36 PM 7/17/2003 -0400, mcarey@environmentaldefense.org wrote:

> This analysis was published on Discover online about a month ago. Within  
> days (maybe just a day) of publication on that website, the Soon and  
> Baliunas piece was touted as, "as featured on Discover" in a letter to  
> Capitol Hill staff from Senator Inhofe of Oklahoma.

>  
> The Atlanta Journal Constitution has written a story in which this all is  
> described. It's attached below:

>  
> Nonprofits push controversial climate study

>  
>  
> <http://www.ajc.com/business/content/business/0603/01warming.html>

>  
> By JEFF NESMITH  
> The Atlanta Journal-Constitution

>  
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>  
> WASHINGTON -- Nonprofit organizations with ties to energy interests are  
> promoting a controversial climate study as proof that prevailing views of  
> global warming are wrong.

>  
>  
> The scientists who authored the new study contend that the global warming

> of recent decades is not without precedent during the past 1,000 years, as  
> other scientists have claimed. In fact, they say the Earth was even warmer  
> during what is known as the "medieval warm period" between 900 and 1300  
> A.D.

>  
>  
> The paper has touched off a worldwide storm of e-mail among climate  
> scientists, some of whom have proposed organizing a research boycott of two  
> journals that published the study.

>  
> The links among authors of the new study, the nonprofit groups and the  
> energy interests illustrate a three-way intersection of money, science and  
> policy. Energy interests underwrote the study and help finance the groups  
> that are promoting it.

>  
> The study also illustrates a strategy adopted by some energy companies in  
> the late 1980s to attack the credibility of climate science, said John  
> Topping, president of the Climate Institute.

>  
> "They saw early on that what they had to do was keep the science at issue,"  
> said Topping, a former Republican congressional staffer who founded the  
> institute in 1986.

>  
> By relying on the news media's inclination to include both sides of a  
> story, the industries were able to create the impression that scientists  
> were deeply divided over climate change, Topping said.

> "It was all very shrewdly done," he added.

>  
> The Climate Institute takes the position that climate change threatens the  
> global environment and promotes international cooperation on the issue.  
> Less than 1 percent of its funding has come from oil industry sources,  
> Topping said, with the rest coming from foundations.

>  
> To measure long-term climate patterns, scientists rely on "proxy"  
> indicators, such as the content of air bubbles trapped centuries ago under  
> ice packs in Greenland and Antarctica, the chemical makeup of ancient ocean  
> sediments, and the relative widths of old tree rings.

>  
> These natural records have been used to portray a global climate that has  
> been largely stable until the late 1980s, when temperatures started rising  
> sharply.

>  
> A millennium of these temperature records presents what has been called a  
> "hockey stick" graph, depicting centuries with little relative change, then

> a sharp and sudden rise during the past two decades.  
>  
>  
> Most climate scientists think the rise results from the atmospheric buildup  
> of heat-trapping "greenhouse gases," especially carbon dioxide released by  
> the combustion of fossil fuels such as coal and petroleum.  
>  
>  
> Industry-backed groups claim the new study challenges the validity of this  
> view by presenting evidence of global warming at a time when fossil fuels  
> were not being burned in appreciable quantities.  
>  
>  
> The new study, "Reconstructing Climatic and Environmental Changes of the  
> Past 1,000 Years: A Reappraisal," was published several weeks ago in a  
> British scientific journal, Energy and Environment.  
>  
>  
> The authors contend in the 65-page paper that their reanalysis of data from  
> more than 200 previous climate studies provides evidence of global  
> temperature shifts that are more dramatic than the current one, including  
> during the "medieval warm period."  
>  
>  
> The research was underwritten by the American Petroleum Institute, the  
> trade association of the world's biggest oil companies.  
>  
>  
> Two of the five authors are scientists who have been linked to the coal  
> industry and have received support from the ExxonMobil Foundation.  
>  
>  
> Two others, who are affiliated with the Harvard-Smithsonian Center for  
> Astrophysics, also have the title of "senior scientists" with a  
> Washington-based organization supported by conservative foundations and  
> ExxonMobil Corp.  
>  
>  
> The organization, the George T. Marshall Institute, is headed by William  
> O'Keefe, a former executive of the American Petroleum Institute.  
>  
>  
> O'Keefe also was at one time the president of the Global Climate Coalition,  
> a now-defunct organization created by oil and coal interests to lobby  
> against U.S. participation in climate treaties, such as the Kyoto Protocol.  
>  
>  
> "Statements made about the warming trend of the 20th century and the 1990s  
> do not withstand close scrutiny," O'Keefe declared at a recent luncheon  
> held in the Dirksen Senate Office Building here.  
>  
>  
> The purpose of the luncheon was for Willie Soon, a physicist and astronomer  
> with the Harvard-Smithsonian Center, to present a summary of the new

> research.  
>  
>  
> Promotion of the scientists' arguments began with a news release issued by  
> the public affairs office of the Harvard-Smithsonian Center shortly after  
> the paper was published. Headlined "20th Century Climate Not So Hot," the  
> release declared that the scientists had "determined" that the current  
> warming trend is neither the hottest nor the most dramatic change in the  
> past 1,000 years.  
>  
>  
> Didn't publish the release  
>  
>  
> Major news organizations failed to publish the news release. However, it  
> was picked up by the Discovery Channel Online, which declared that the 20th  
> century may have been "just another bump in the climate road."  
>  
>  
> The Discovery Channel Online article was immediately copied and distributed  
> by the staff of the Senate Environment and Public Works Committee, headed  
> by Sen. James Inhofe (R-Okla.), an outspoken skeptic about climate change.  
>  
>  
> The committee also circulated a statement by the Competitive Enterprise  
> Institute declaring that "the hockey stick theory has effectively been  
> dismantled" and "the margin of error is so large that nearly any  
> temperature trend could be drawn to fit within it."  
>  
>  
> The principal target of the paper by Soon and his co-authors was Michael  
> Mann of the University of Virginia, whose landmark compilation of thousands  
> of "proxy" indicators led to the conclusion that the last two decades have  
> been unusually warm and to the first depiction of the "hockey stick" graph.  
>  
>  
> Mann said last week that the Soon study does not even attempt to  
> reconstruct global average temperatures but simply highlights anecdotal  
> evidence of isolated warming trends.  
>  
>  
> In a statement issued jointly with environmental scientist Michael  
> Oppenheimer of Princeton University, Mann said that when all of these  
> indicators are compiled and averaged, the "medieval warming period" fits  
> within the long-range global trend. He said this was done not only in his  
> study but also in nearly a dozen that have followed it.  
>  
>  
> Soon acknowledged during a question period at the Senate luncheon that his  
> research does not provide such a comprehensive picture of the Earth's  
> temperature record. He questioned whether that is even possible, and said  
> he did not see how Mann and the others could "calibrate" the various proxy  
> records for comparison.  
>

>  
> "Then he needs to educate himself on several decades of very careful,  
> painstaking research," Mann snapped.  
>  
>  
> The energy industry provides significant funding for groups that employ  
> some of the authors or promote their new study.  
>  
>  
> Soon's four co-authors were Sallie Baliunas, also from the  
> Harvard-Smithsonian center; Sherwood Idso and his son, Craig Idso, both of  
> Tempe, Ariz., who are the past president and the current president of an  
> organization called the Center for the Study of Carbon Dioxide and Global  
> Change; and David R. Legates, a climate researcher at the University of  
> Delaware.  
>  
>  
> The Idsos, who have previously been linked to Western coal interests, do  
> not reveal the sources of financial support for their center, which on its  
> Web site presents summaries of scientific studies purporting to raise  
> questions about prevailing climate change theories.  
>  
>  
> The center had a budget of nearly \$400,000 in 2001, the most recent year  
> for which nonprofit statements to the Internal Revenue Service are  
> available.  
>  
>  
> It operates from a post office box and offices in the homes of Craig and  
> Sherwood Idso and a second son of Sherwood Idso, Keith Idso.  
>  
>  
> Identities of the four donors who provided the organization's \$397,000  
> contributions in 2001 are blanked out of the Internal Revenue Service  
> filing, and Sherwood Idso declined to name them.  
>  
>  
> "We generally do not say anything about our funding," he said. "The feeling  
> is that what we produce there should be evaluated on its own merit, not  
> where any funding comes from."  
>  
>  
> Records filed with the IRS by ExxonMobil Foundation show that it provided a  
> grant of \$15,000 to the Arizona center in 2000. These records and others  
> show that ExxonMobil Foundation and ExxonMobil Corp. also have contributed  
> \$160,000 to the George T. Marshall Institute in the past three years and  
> more than \$900,000 to the Competitive Enterprise Institute.  
>  
>  
> In a telephone interview, Soon declined to say how much he is paid to serve  
> as a "senior scientist" with the George T. Marshall Institute. Both he and  
> Baliunas have that title.  
>  
>





Subject: conference call  
From: "Raymond S. Bradley" <rbradley@geo.umass.edu>  
Date: 7/22/03 10:46 AM  
To: mann@multiproxy.evsc.virginia.edu, mhughes@ltrr.arizona.edu, srutherford@virginia.edu

MKH & i discussed a time for a conference call--how about next Monday, 7/28, at 2pm our time (11am Malcolm's time)...if this is OK, can you ask your dept secretary how to organise this? Our staff are all AWOL...

MKH's number will be:

520-621-6470. Mine will be: [REDACTED]

ray

Raymond S. Bradley  
Distinguished Professor  
Director, Climate System Research Center\*  
Department of Geosciences  
Morrill Science Center  
611 North Pleasant Street  
AMHERST, MA 01003-9297

Tel: 413-545-2120

Fax: 413-545-1200

\*Climate System Research Center: 413-545-0659

<<http://www.paleoclimate.org>>

Paleoclimatology Book Web Site: <http://www.geo.umass.edu/climate/paleo/html>

Subject: Re: conference call  
From: "Raymond S. Bradley" <rbradley@geo.umass.edu>  
Date: 7/22/03 11:58 AM  
To: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>  
CC: mhughes@ltrr.arizona.edu, srutherford@virginia.edu

Sorry--I forgot about that. Wed at 2pm is ok with me  
ray

Subject: Fwd: are you back?  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 7/23/03 8:19 AM  
To: rbradley@geo.umass.edu, mhughes@ltr.arizona.edu, omichael@princeton.edu

ironic, hunh?

> Sensitivity:  
> Subject: are you back?  
> To: mann@virginia.edu  
> X-Mailer: Lotus Notes Release 5.0.9 November 16, 2001  
> From: Jeff Nesmith <jeffn@coxnews.com>  
> Date: Wed, 23 Jul 2003 10:56:20 -0400  
> X-MIMETrack: Serialize by Router on CN-ATL-NML01/Coxnews(Release 6.0.1CF1 | March 06, 2003) at  
> 07/23/2003 10:56:14 AM  
> X-MIME-Autoconverted: from base64 to 8bit by multiproxy.evsc.Virginia.EDU id h6NF2Ow208  
> ^BC-CLIMATE-OIL23-COX@<  
> ^DOE HELPS OIL COMPANIES COPE WITH GLOBAL WARMING@<  
> ^Moving in (w) Washington and (f) financial categories.@<  
> ^By JEFF NESMITH@=  
> ^Cox News Service@=  
> WASHINGTON \_ Global warming, which most climate experts blame  
> mainly on large-scale burning of oil and other fossil fuels, is  
> interfering with efforts in Alaska to discover yet more oil.  
> The U.S. Department of Energy plans to help oil companies and  
> Alaska officials find a way around the problem.  
> A state of Alaska rule says heavy exploration equipment can be  
> used on fragile tundra only when the ground is frozen to 12 inches  
> deep and covered by at least six inches of snow.  
> However, because winters in the Arctic are becoming shorter, the  
> number of days the tundra meets those conditions has shrunk  
> from more than 200 in 1970 to only 103 last year, a state document  
> notes.  
> The Energy Department is providing a \$270,000 grant to help  
> determine whether there are ways the equipment can be used even  
> when the tundra is not protected by snow.  
> In a June 3 news release, the Energy Department did not refer to  
> global warming. Instead, it quoted Mike Smith, the assistant energy  
> secretary for fossil energy, as saying the grant will be combined  
> with \$70,000 put up by oil companies to ``refine our understanding  
> of the tundra's resistance to disturbances."  
> But according to the state's description of the research, the  
> shorter period for frozen tundra ``appears consistent with findings  
> of general warming in the Alaska Arctic associated with global  
> climate change."  
> ``It is unlikely that the oil industry can implement successful  
> exploration and development plans with a winter work season  
> consistently less than 120 days," says the Alaska project  
> description. ``Therefore, it is imperative that the Alaska  
> Department of Natural Resources develop a new set of criteria that  
> will simultaneously increase the number of days available to  
> companies to conduct exploration and ice road construction in  
> winter while providing equal or greater environmental protection of

> the tundra."  
> One of the arguments by those who favor oil exploration in the  
> Arctic National Wildlife Refuge is that work there would be  
> conducted only during winter months so that the tundra would be  
> protected.  
> Rep. Ed Markey, D-Mass., a member of the House Energy and  
> Commerce Committee and a vocal opponent of ANWR development, said  
> that "for years, proponents of drilling in the Arctic refuge have  
> unpersuasively argued that by doing all their development during  
> the winter season on ice roads, the impact on the tundra would be  
> negligible.  
> "Now they admit that they can't afford to drill unless they are  
> allowed to trample the tundra in the non-winter season," he said.  
> "The supreme irony is that the winter season is getting shorter  
> because of a pronounced warming of the climate brought on, in part,  
> by the burning of oil."  
> Rafe Pomerance, president of Americans for Equitable Climate  
> Solutions, a group that explores scientific and political issues  
> related to climate change, said the Energy Department grant  
> "validates the fact that Alaska is warming rapidly and that  
> significant damage is occurring."  
>  
> On the Web:  
> State description of study:  
> [www.gov.state.ak.us/omb/04\(underscore\)OMB/budget/DNR/proj38391.pdf](http://www.gov.state.ak.us/omb/04(underscore)OMB/budget/DNR/proj38391.pdf)  
>  
> Jeff Nesmith's e-mail address is [jeffn\(at\)coxnews.com](mailto:jeffn(at)coxnews.com)  
>  
> ENDIT

---

Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

---

e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: WOW

From: "Michael E. Mann" <mann@virginia.edu>

Date: 7/23/03 8:38 AM

To: rbradley@geo.umass.edu, mhughes@ltr.arizona.edu, Phil Jones <p.jones@uea.ac.uk>, Tom Crowley <tcrowley@duke.edu>, mann@virginia.edu

Folks,

check this out:

[http://www.signonsandiego.com/news/uniontrib/thu/opinion/news\\_mz1e17barnet.html](http://www.signonsandiego.com/news/uniontrib/thu/opinion/news_mz1e17barnet.html)

The canary is singing, folks...

mike

p.s. the skeptics have already issued their attempt at a pre-emptive strike:

[http://www.co2science.org/edit/v6\\_edit/v6n30edit.htm](http://www.co2science.org/edit/v6_edit/v6n30edit.htm)

---

Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

---

e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: conference call  
From: Scott Rutherford <srutherford@gso.uri.edu>  
Date: 7/24/03 6:43 AM  
To: Mann Mike <mann@virginia.edu>, Bradley Raymond <rbradley@geo.umass.edu>, Hughes Malcolm <mhughes@lrr.arizona.edu>

Dear All,

I've looked into initiating the conference call and it can be done but requires some hoops to be jumped through. If Ray can do 3-way calling on his phone (something that is standard on the phones here) then I can be in Amherst and he and I can talk on a speaker phone.

Let me know what you think.

Cheers,

Scott

---

Scott Rutherford

Marine Research Scientist  
Graduate School of Oceanography  
University of Rhode Island  
e-mail: srutherford@gso.uri.edu  
phone: (401) 874-6599  
fax: (401) 874-6811  
snail mail:  
South Ferry Road  
Narragansett, RI 02882

Subject: Re: conference call  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 7/24/03 6:52 AM  
To: Scott Rutherford <srutherford@gso.uri.edu>  
CC: Mann Mike <mann@virginia.edu>, Bradley Raymond <rbradley@geo.umass.edu>, Hughes Malcolm <mhughes@lrr.arizona.edu>

Hi Scott,

This sounds like a good option. Ray: do you have that?

If not, I'll look into other options,

mike

At 09:43 AM 7/24/2003 -0400, you wrote:

> Dear All,

>

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>

> Let me know what you think.

>

> Cheers,

>

> Scott

>

> \_\_\_\_\_  
> Scott Rutherford

>

> Marine Research Scientist

> Graduate School of Oceanography

> University of Rhode Island

> e-mail: srutherford@gso.uri.edu

> phone: (401) 874-6599

> fax: (401) 874-6811

> snail mail:

> South Ferry Road

> Narragansett, RI 02882

>

\_\_\_\_\_  
Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
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Charlottesville, VA 22903

\_\_\_\_\_  
e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: Re: conference call  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 7/24/03 6:52 AM  
To: Scott Rutherford <srutherford@gso.uri.edu>  
CC: Mann Mike <mann@virginia.edu>, Bradley Raymond <rbradley@geo.umass.edu>, Hughes Malcolm <mhughes@lrr.arizona.edu>

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If not, I'll look into other options,

mike

At 09:43 AM 7/24/2003 -0400, you wrote:

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>

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>

> Let me know what you think.

>

> Cheers,

>

> Scott

>

> \_\_\_\_\_  
> Scott Rutherford

>

> Marine Research Scientist

> Graduate School of Oceanography

> University of Rhode Island

> e-mail: srutherford@gso.uri.edu

> phone: (401) 874-6599

> fax: (401) 874-6811

> snail mail:

> South Ferry Road

> Narragansett, RI 02882

>

\_\_\_\_\_  
Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
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Charlottesville, VA 22903

\_\_\_\_\_  
e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: copyright form  
From: Scott Rutherford <srutherford@gso.uri.edu>  
Date: 7/28/03 11:28 AM  
To: Mann Mike <mann@virginia.edu>, Osborn Tim <t.osborn@uea.ac.uk>, Hughes Malcolm <mhughes@ltrr.arizona.edu>, Bradley Raymond <rbradley@geo.umass.edu>, Briffa Keith <k.briffa@uea.ac.uk>, Jones Phil <p.jones@uea.ac.uk>

Dear All,

Attached to this e-mail is the copyright form for Journal of Climate. Please print it out, sign it and fax it to 970-491-8693. They will not send the manuscript out for review until they have everyone's signature. Please follow the fax by sending the original to:

Dr. David Randall  
Chief Editor, Journal of Climate  
Department of Atmospheric Sciences  
Colorado State University  
200 West Lake Street  
Fort Collins, Colorado 80523

I will post the submitted version of the manuscript on anonymous ftp at [holocene.evsc.virginia.edu/pub/sdr/preprints](http://holocene.evsc.virginia.edu/pub/sdr/preprints).

Cheers,

Scott

---

Scott Rutherford

Marine Research Scientist  
Graduate School of Oceanography  
University of Rhode Island  
e-mail: [srutherford@gso.uri.edu](mailto:srutherford@gso.uri.edu)  
phone: (401) 874-6599  
fax: (401) 874-6811  
snail mail:  
South Ferry Road  
Narragansett, RI 02882

Attachments:  
copyrgh.pdf 21.2 KB

Subject: conference call  
From: Scott Rutherford <srutherford@gso.uri.edu>  
Date: 7/29/03 6:35 AM  
To: Mann Mike <mann@virginia.edu>, Bradley Raymond <rbradley@geo.umass.edu>, Hughes Malcolm <mhughes@lrr.arizona.edu>

Dear All,

Looks like I can host a conference call on this end. My information this morning is that 2:00pm EDT tomorrow (Wed.) is fine. I will set it up for 90 minutes unless you think we need more time. I will set it up as soon as I hear that everyone is ok with that arrangement.

Cheers,

Scott

---

Scott Rutherford

Marine Research Scientist  
Graduate School of Oceanography  
University of Rhode Island  
e-mail: srutherford@gso.uri.edu  
phone: (401) 874-6599  
fax: (401) 874-6811  
snail mail:  
South Ferry Road  
Narragansett, RI 02882

Subject: conference call  
From: Scott Rutherford <srutherford@gso.uri.edu>  
Date: 7/29/03 11:40 AM  
To: Mann Mike <mann@virginia.edu>, Bradley Raymond <rbradley@geo.umass.edu>, Hughes Malcolm <mhughes@lrr.arizona.edu>

We are all set for a conference call tomorrow 2:00pm EDT. I've set aside 90 minutes, but it doesn't really matter if we use more or less.

The number to call is 1-866-892-8710 and the passcode is 3758646. You should be prompted for the passcode after dialing the number. (That's what they tell me anyway.)

Let me know if you have questions.

Scott

---

Scott Rutherford

Marine Research Scientist  
Graduate School of Oceanography  
University of Rhode Island  
e-mail: srutherford@gso.uri.edu  
phone: (401) 874-6599  
fax: (401) 874-6811  
snail mail:  
South Ferry Road  
Narragansett, RI 02882

Subject: Re: report  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 7/30/03 5:29 AM  
To: "Malcolm Hughes" <mhughes@ltrr.arizona.edu>

Thanks Malcolm,

I did --well tell you guys more about this during our conference call today. Hearing went extremely well...

mike

At 09:27 PM 7/29/2003 -0700, you wrote:

- > Mike - did you see this? Malcolm
- > <http://ens-news.com/ens/jul2003/2003-07-29-10.asp>
- >
- > .
- > .
- > .Malcolm Hughes
- > Professor of Dendrochronology
- > Laboratory of Tree-Ring Research
- > University of Arizona
- > Tucson, AZ 85721
- > 520-621-6470
- > fax 520-621-8229

---

Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

---

e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: Fwd: Here's the story.

From: "Michael E. Mann" <mann@virginia.edu>

Date: 7/31/03 7:38 AM

To: Mike MacCracken <mmaccrac@comcast.net>, Michael Oppenheimer <omichael@Princeton.EDU>, rbradley@geo.umass.edu, mhughes@ltr.arizona.edu, Tom Wigley <wigley@ucar.edu>, Kevin Trenberth <trenbert@ucar.edu>, Phil Jones <p.jones@uea.ac.uk>, Jonathan Overpeck <jto@u.arizona.edu>, Ellen Mosley-Thompson <thompson.4@osu.edu>, Steve Schneider <shs@stanford.edu>, Stefan Rahmstorf <rahmstorf@pik-potsdam.de>, Eric Steig <steig@ess.washington.edu>, Tom Crowley <tcrowley@duke.edu>, Ben Santer <santer1@llnl.gov>

Not a bad job, for the WSJ!

Will be a bit tough for Inhofe to argue that these are the rantings of a liberal rag!

mike

> From: "Michael E. Mann" <mann@virginia.edu>

> Subject: Fwd: Here's the story.

>

>

>> Delivered-To: mem6u@virginia.edu

>> From: "McGough, Bob" <Bob.McGough@wsj.com>

>> To: "Michael E. Mann" <mann@virginia.edu>

>> Subject: Here's the story.

>> Date: Thu, 31 Jul 2003 09:58:45 -0400

>> X-Mailer: Internet Mail Service (5.5.2654.89)

>>

>> July 31, 2003

>> f038b2f.jpg

>> f038b61.jpg f038b89.jpg f038ba7.jpg f038bc5.jpg

>> DEBATING GLOBAL WARMING

>> f038c0b.jpg

>>

>> Global Warming Skeptics

>> Are Facing Storm Clouds

>>

>> By ANTONIO REGALADO

>> Staff Reporter of THE WALL STREET JOURNAL

>>

>> A big flap at a little scientific journal is raising questions about a study that has been embraced by conservative politicians for its rejection of widely held global-warming theories.

>>

>> The study, by two astronomers at the Harvard-Smithsonian Center for Astrophysics, says the 20th century wasn't unusually warm compared with earlier periods and contradicts evidence indicating man-made "greenhouse" gases are causing temperatures to rise.

>>

>> Since being published last January in Climate Research, the paper has been widely promoted by Washington think tanks and cited by the White House in revisions made to a recent Environmental Protection Agency report. At the same time, it has drawn stinging rebukes from other climate scientists.

>>

>> This week, three editors of Climate Research resigned in protest over the journal's handling of the review process that approved the study; among them is Hans von Storch, the journal's recently appointed editor in chief. "It was flawed and it shouldn't have been published," he said.

>>

>> Dr. von Storch's resignation was publicly disclosed Tuesday by Sen. James Jeffords (I., Vt.), a critic of the administration's environmental policies, during a hearing of the Senate Environment and Public Works Committee called by its chairman, Sen. James Inhofe (R., Okla.).

>>

>> The debate over global warming centers on the extent to which gases released from the burning of fossil fuels -- mainly carbon dioxide -- are trapping the sun's heat in the Earth's atmosphere, creating a greenhouse effect. The political fight has intensified as the Senate votes on a major energy bill. Sens. John McCain (R., Ariz.) and Joseph Lieberman (D., Conn.) planned to introduce an amendment this week that would cap carbon-dioxide emissions at 2000 levels starting in 2010 for select industries. The Bush administration is opposed to imposing caps, and the measure isn't expected to become law.

>>

>> The Harvard study has become part of skeptics' arguments. Mr. Inhofe, who is leading the opposition to the emissions measures, cited the research in a speech on the Senate floor Monday in which he said, "the claim that global warming is caused by man-made emissions is simply untrue and not based on sound science."

>>

>> The paper was authored by astronomers Willie Soon and Sallie Baliunas, and looked at studies of tree rings and other indicators of past climate. Their basic conclusion: The 20th century wasn't the warmest century of the past 1,000 years. They concluded temperatures may have been higher during the "Medieval Warm Period," the time during which the Norse settled Greenland.

>>

>> Dr. Soon couldn't be reached and Dr. Baliunas declined comment. In his testimony before Mr. Inhofe's committee, Dr. Soon reiterated the findings of his study, which was partly funded by the American Petroleum Institute.

>>

>> Dr. Soon's findings contradict widely cited research by another scientist, Michael E. Mann of the University of Virginia. Dr. Mann's reconstruction of global temperatures shows a distinct pattern shaped like a hockey stick: Temperatures stayed level for centuries, with a sudden upturn during recent decades.

>>

>> A reference to Dr. Soon's paper previously found its way into revisions suggested by the White House to an EPA report on environmental quality. According to an internal EPA memorandum disclosed in June, agency scientists were concerned the version containing the White House edits "no longer accurately represents scientific consensus on climate change." Dr. Mann's data showing the hockey-stick temperature curve was deleted. In its place, administration officials added a reference to Dr. Soon's paper, which the EPA memo called "a limited analysis that supports the administration's favored message."

>>

>> The EPA says the memo appears to be an internal e-mail between staffers but isn't an "official" document. A spokesman at the White House's Council on Environmental Quality says the addition of the citation to Dr. Soon's paper to the draft report was suggested during an interagency review process overseen by the White House.

>>

>> Dr. Mann and 13 colleagues published a critique of Dr. Soon's paper in Eos, a publication of the American Geophysical Union, this month. They said the Harvard team's methods were flawed and their results "inconsistent with the preponderance of scientific evidence."

>>

>> Then, last week Dr. von Storch was contacted by Sen. Jeffords's staff, which was looking into the paper in preparation for Tuesday's hearing, where Dr. Soon and Dr. Mann were scheduled to appear. After hearing from Sen. Jeffords, Dr. von Storch says he decided to speed an editorial into print criticizing publication of the paper.

>>

>> But publisher Otto Kinne blocked the move, saying that while he favored publication of the editorial, Dr. von Storch's proposals were still opposed by some of the other editors. "I asked Hans not to rush the editorial," Mr. Kinne said in an e-mail.

>>

>> That is when Dr. von Storch resigned, followed by two other editors.

>>

>> --John J. Fialka contributed to this article.

>>  
> Professor Michael E. Mann  
> Department of Environmental Sciences, Clark Hall  
> University of Virginia  
> Charlottesville, VA 22903

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> e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (434) 924-7770 FAX: (434) 982-2137  
> <http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: op-ed  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 7/31/03 2:49 PM  
To: David Seago <david.seago@mail.tribnet.com>

Dear David,

By any chance, is it the same Baliunas op-ed that appeared last week in the Providence Journal (below)?

Thanks,

mike

> Sallie Baliunas: Combatting global warming would be a waste

>

> 07/25/2003

>

> WASHINGTON

>

> HUMANS RECORD historical events, Herodotus wrote, "in the hope of preserving from decay the remembrance of what men have done."

>

> Nature also writes its own history. And when coupled with that written by men, it can ameliorate the tendency to sensationalize current trends in climate into something unusual or dangerous.

>

> Recently, Sen. John Kerry of my home state, Massachusetts, and a leading Democratic Party presidential candidate, added to the alarmism over climate change. At an environmental conference in Washington, he compared the "threat of global warming" with that of the Cold War, indicating that it required the same mobilization of national resources as was needed to defeat Soviet communism.

>

> In a similar vein, attorneys general from six states are suing the federal government to enforce reductions in carbon dioxide emission, which is essential to life on the planet and has never been classified as a toxic pollutant but is blamed by alarmists for warming the globe. New York and some other states are even considering legislation for the state to enforce reductions in the emission of CO2, which arises mainly from burning fossil fuels.

>

> These domestic calls for action echo a United Nations-sponsored worldwide plan, called the Kyoto Protocol. It requires signatories to reduce their greenhouse gas emissions based upon the notion that the Earth is dangerously warming.

>

> The historical record -- both man and nature's -- doesn't support this view.

>

> It is true that, according to thermometer measurements, the Earth was warmer by some 0.6 degrees Celsius at the end of the 20th Century than it was in the second half of the 19th. And because the 20th Century also coincided with an increased concentration of human-made greenhouse gases in the air, it may be argued that the 20th Century's warmth -- and future global warming -- was and will be caused, at least in part, by the burning of fossil fuels.

>

> But to get a proper estimate of the amount of human-made global warming a demonstration is required that the 20th Century actually was unusually warm, and that the 19th Century was normal. Were they?

>

> To find the answer, we must go back several centuries to a period when the amount of greenhouse gases emitted

- from human activities was minimal. At that time, the instrumentally measured record of global temperature change was insufficient to detail climate's natural fluctuations, as the record dates only to the mid-19th Century.
- >
- > Nature's record, however, goes back much further.
- >
- > What makes up that record? It is natural indicators -- or proxies -- of climate information derived from glaciers, boreholes, coral, tree growth, sediments of pollen, insects or sea organisms, river effluvia, dune migration, stalactites and stalagmites, plus human documentary evidence such as weather diaries or crop accounts.
- >
- > The technique of studying proxies isn't easy. There are many differences among proxies, so averaging across many proxies remains tricky. Another difficulty is that no one type of proxy is widely available to make a meaningful global average.
- >
- > Because of these limitations, proxies are best viewed as records of local climate, with each accounted for in the context of its limits and uncertainties -- in time, geographical extent and climate sensitivity.
- >
- > Nonetheless, despite the problems, there is a wealth of climate information from proxies that can now be culled using modern technology to provide a history of climate at many locations worldwide.
- >
- > And a recent review ( <http://cfa-www.harvard.edu/press/pr0310.html> ) by a team from Harvard University, of more than 240 scientific articles by over 1,000 researchers using the various proxy data shows that the climate in most locations was not extreme or unusual during the 20th Century. Instead, the warmest, or most extreme, climate for those locations occurred in the Medieval Warm Period, between the 9th and 14th centuries.
- >
- > That period of extreme climate -- long before the air's increase in greenhouse gas concentration from human activities -- must have natural explanations. Whatever they are, the results of the warming, as far as man was concerned, in most cases appear to have been more beneficial than dangerous. Vikings made their way to Greenland and Newfoundland in that period. And England had productive vineyards.
- >
- > H.H. Lamb, the founder of the climatic research unit at East Anglia University, found that England's climate was warm enough in the 12th and 13th centuries to support more than 50 vineyards, signifying that May frosts were rare. But natural swings in climate ended that environment, beginning with a period known as the Little Ice Age, lasting about from 1300 to 1900 C.E., during which Europe had more acute winters. The intensity of the Little Ice Age reached its peak from 1550 to 1700, bringing crop failures, disease and death. Many died of famine in Scotland during crop failures in seven of eight years at the end of the 18th Century.
- >
- > That the last millennium has seen periods warmer than the 20th Century in many parts of the world where there is information means that the 20th Century was not unusual. Meanwhile, the 19th Century, where thermometer records begin, seems to have been the tail of an unusual cold period that had persisted for some centuries, perhaps as far back as the 14th Century in some areas. It was not so normal.
- >
- > The scientific history drawn from nature and man's observations over the last millennium suggests that a strong trend of human-induced warming does not exist. The scientific facts indicate that costly policies to combat global warming are unlikely to mitigate any of climate's ever-present natural risks, but they could reduce society's economic ability to cope with them.
- >
- > Sallie Baliunas is senior scientist at George C. Marshall Institute and TechCentralStation enviro-science host

Professor Michael E. Mann  
 Department of Environmental Sciences, Clark Hall  
 University of Virginia  
 Charlottesville, VA 22903



Subject: op-ed for Seattle News Tribute

From: "Michael E. Mann" <mann@virginia.edu>

Date: 8/3/03 2:06 PM

To: Raymond Bradley <rbradley@geo.umass.edu>, Malcolm Hughes <mhughes@ltrr.arizona.edu>, Phil Jones <p.jones@uea.ac.uk>, Kevin Trenberth <trenbert@ucar.edu>, Tom Crowley <tcrowley@duke.edu>, Tom Wigley <wigley@ucar.edu>, Scott Rutherford <srutherford@gso.uri.edu>, Caspar Ammann <ammann@ucar.edu>, Keith Briffa <k.briffa@uea.ac.uk>, Tim Osborn <t.osborn@uea.ac.uk>, Michael Oppenheimer <omichael@princeton.edu>, Steve Schneider <shs@stanford.edu>, Gabi Hegerl <hegerl@duke.edu>, rahmstorf@pik-potsdam.de, Mike MacCracken <mmaccrac@comcast.net>, Ellen Mosley-Thompson <thompson.4@osu.edu>, Eric Steig <steig@ess.washington.edu>, jmahlman@ucar.edu, wuebbles@atmos.uiuc.edu, Caspar Ammann <ammann@ucar.edu>, jto@u.arizona.edu  
CC: mann@virginia.edu

Dear All,

Attached is the op-ed that Ray Bradley, Phil Jones, and I have submitted in response to Baliunas' op-ed piece which is to appear in the Seattle News Tribute. Our reply should appear shortly after or with her piece. I've also attached a version of her op-ed piece that appeared in last week's Providence Journal--apparently, its identical to the one to appear in the Seattle NT. We were limited to a by-line of 3 individuals, otherwise we would have tried to enlist a broader group of signatories.

We're also submitting this to the Providence Journal.

Please feel free to use this for your own purposes if you find it helpful.

Best regards,

Mike

---

Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

---

e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Attachments:

SeattleNewsTribune-oped-final.doc 29.0 KB  
BaliunasProvidenceJournal25Jul03.pdf 118 KB

Subject: Re: op-ed for Seattle News Tribute

From: "Michael E. Mann" <mann@virginia.edu>

Date: 8/4/03 6:59 AM

To: Harvey Leifert <HLeifert@agu.org>

CC: Raymond Bradley <rbradley@geo.umass.edu>, Malcolm Hughes <mhughes@ltrr.arizona.edu>, Phil Jones <p.jones@uea.ac.uk>, Kevin Trenberth <trenbert@ucar.edu>, Tom Crowley <tcrowley@duke.edu>, Tom Wigley <wigley@ucar.edu>, Scott Rutherford <srutherford@gso.uri.edu>, Caspar Ammann <ammann@ucar.edu>, Keith Briffa <k.briffa@uea.ac.uk>, Tim Osborn <t.osborn@uea.ac.uk>, Michael Oppenheimer <omichael@princeton.edu>, Steve Schneider <shs@stanford.edu>, Gabi Hegerl <hegerl@duke.edu>, rahmstorf@pik-potsdam.de, Mike MacCracken <mmaccrac@comcast.net>, Ellen Mosley-Thompson <thompson.4@osu.edu>, Eric Steig <steig@ess.washington.edu>, jmahlman@ucar.edu, wuebbles@atmos.uiuc.edu, jto@u.arizona.edu

Thanks Harvey,

Yes, we're talking about the same paper--it is "Tacoma" rather than "Seattle". Will keep you all posted on when this runs, etc.

Indeed, I'm sure the Baliunas op-ed has been widely peddled. Encouraging that there are only two bits so far. We submitted a revised version of the op-ed you saw to the "Providence Journal". If anyone sees this pop up in any other newspapers, please let us know!

Thanks,

mike

At 09:45 AM 8/4/2003 -0400, Harvey Leifert wrote:

> Mike,

>

> Thanks for forwarding these op-eds to me. The call I originally received was from the Tacoma News Tribune. I am not aware of a Seattle paper of the same name.

>

> If the Baliunas essay was distributed by an advocacy organization, as I was informed, it most likely went to way more than two newspapers at opposite ends of the country. Searches at news.google.com may turn up more papers that have carried the same piece, and you might want to send the Bradley et al. reply to them as well. (I did not see any such references as of this morning.)

>

> Regards,

>

> Harvey

>

> Michael E. Mann wrote:

>> Dear All,

>>

>> Attached is the op-ed that Ray Bradley, Phil Jones, and I have submitted in response to Baliunas' op-ed piece which is to appear in the Seattle News Tribute. Our reply should appear shortly after or with her piece. I've also attached a version of her op-ed piece that appeared in last week's Providence Journal--apparently, its identical to the one to appear in the Seattle NT. We were limited to a by-line of 3 individuals, otherwise we would have tried to enlist a broader group of signatories.

>>

>> We're also submitting this to the Providence Journal.

>>

>> Please feel free to use this for your own purposes if you find it helpful.

>>

>> Best regards,

>>

>> Mike

>>

>>

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>> Professor Michael E. Mann  
>> Department of Environmental Sciences, Clark Hall  
>> University of Virginia  
>> Charlottesville, VA 22903

>>

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>> <http://www.evsc.virginia.edu/faculty/people/mann.shtml>

>

>

> --

> Harvey Leifert

> Public Information Manager

> American Geophysical Union

> 2000 Florida Avenue, N.W.

> Washington, DC 20009, USA

> Phone: +1-202-777-7507

> Fax: +1-202-328-0566

> Email: [hleifert@agu.org](mailto:hleifert@agu.org)

> Web:

> [http://www.agu.org/sci\\_soc/media.html](http://www.agu.org/sci_soc/media.html)

> ###

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<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: FYI--transcript of the senate EPW committee hearing of July 29, 2003

From: "Michael E. Mann" <mann@virginia.edu>

Date: 8/5/03 2:44 PM

To: Raymond Bradley <rbradley@geo.umass.edu>, Phil Jones <p.jones@uea.ac.uk>, Tom Wigley <wigley@ucar.edu>, mhughes@ltrr.arizona.edu, Michael Oppenheimer <omichael@Princeton.EDU>, Kevin Trenberth <trenbert@ucar.edu>, Scott Rutherford <srutherford@gso.uri.edu>, Stefan Rahmstorf <rahmstorf@pik-potsdam.de>, j.salinger@niwa.co.nz, Gavin Schmidt <gavin@isis.giss.nasa.gov>, Drew Shindell <dshindel@thebes.giss.nasa.gov>, Tom Crowley <tcrowley@duke.edu>, Mike MacCracken <mmaccrac@comcast.net>, jeffrey.park@yale.edu, dhondt@gsosun1.gso.uri.edu, Eric Steig <steig@ess.washington.edu>, Tim Osborn <t.osborn@uea.ac.uk>, Keith Briffa <k.briffa@uea.ac.uk>, Caspar M Ammann <ammann@ucar.edu>, Stephen H Schneider <shs@stanford.edu>  
CC: mann@virginia.edu

the transcript is mostly accurate, though the stenographer made a few mis-quotes, typos, etc...

mike

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Professor Michael E. Mann  
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<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Attachments:

transcript-SenateEPW29Jul03.pdf 231 KB

Subject: FYI. From today's NYT...

From: "Michael E. Mann" <mann@virginia.edu>

Date: 8/5/03 5:51 AM

To: rbradley@geo.umass.edu, mhughes@ltr.arizona.edu, Tom Wigley <wigley@ucar.edu>, Kevin Trenberth <trenbert@ucar.edu>, Keith Briffa <k.briffa@uea.ac.uk>, phil Jones <p.jones@uea.ac.uk>, Tim Osborn <t.osborn@uea.ac.uk>, Michael Oppenheimer <omichael@Princeton.EDU>, Stefan Rahmstorf <rahmstorf@pik-potsdam.de>, Mike MacCracken <mmaccrac@comcast.net>

CC: asocci@cox.net

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Professor Michael E. Mann

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Charlottesville, VA 22903

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e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137

<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Attachments:

RevkinNYTimesAug5-03.pdf 170 KB

Subject: Re: Quick query - CO2 fertilization and MBH 98  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 8/5/03 5:17 PM  
To: "Andy Bunn" <abunn@montana.edu>  
CC: mhughes@ltrr.arizona.edu, mann@virginia.edu

Hi Andy,

Thanks for your message.

Actually, the "Earth Interactions" paper is a peer-reviewed article, and can be cited as:

Mann, M.E., Gille, E., Bradley, R.S., Hughes, M.K., Overpeck, J.T., Keimig, F.T., Gross, W., Global Temperature Patterns in Past Centuries: An interactive presentation, Earth Interactions, 4-4, 1-29, 2000.

I wasn't familiar w/ the D'Arrigo et al paper. Frankly, though, this isn't really my area of expertise, its more Malcolm Hughes.

So I've taken the liberty of forwarding this to Malcolm. (Malcolm: any thoughts?) who I'm hoping might be able to be of more help.

Thanks again for the inquiry.

best regards,

Mike Mann

At 05:50 PM 8/5/2003 -0600, you wrote:

> Dr Mann:

>

> I'm a PhD student working with Lisa Graumlich (and collaborating with  
> Malcolm) and expanding her work on high elevation tree-ring chronologies  
> from the Sierra Nevada.

>

> I'm looking for literature on CO2 fertilization on high elevation trees.  
> I'm finding a lot of talk and not a lot of good data. The best graphic  
> I've seen is on the Earth Interactive site showing the no-dendro results  
> of the MBH reconstruction.

>

> [http://www.ngdc.noaa.gov/paleo/ei/ei\\_nodendro.html](http://www.ngdc.noaa.gov/paleo/ei/ei_nodendro.html)

>

> Quick question: Has that graphic been published?

>

> Not as quick question: Do you have a tree-ring and CO2 and tree-ring  
> citation in your head more recent or better than the 1997 Jacoby and  
> D'Arrigo paper in PNAS (Tree Rings, Carbon Dioxide, and Climatic  
> Change)?

>

> That paper has only been cited 10 times according to the ISI and nowhere  
> do I find a refutation to their conclusion that:

>

> The present tree-ring evidence for a possible CO2 fertilization effect  
> under natural environmental conditions appears to be very limited.

>  
> Thanks in advance, Andy Bunn

---

Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

---

e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: check out the link, especially the image...

From: "Michael E. Mann" <mann@virginia.edu>

Date: 8/7/03 2:14 PM

To: rbradley@geo.umass.edu, mhughes@ltrr.arizona.edu, Scott Rutherford <srutherford@gso.uri.edu>, Phil Jones <p.jones@uea.ac.uk>

[http://www.salon.com/tech/feature/2003/08/07/global\\_warming/index\\_np.html](http://www.salon.com/tech/feature/2003/08/07/global_warming/index_np.html)

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<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: From: "Michael E. Mann" <mann@virginia.edu>

Date: 8/7/03 2:32 PM

To: Phil Jones <p.jones@uea.ac.uk>, Raymond Bradley <rbradley@geo.umass.edu>, Malcolm Hughes <mhughes@ltrr.arizona.edu>, Scott Rutherford <srutherford@gso.uri.edu>

[http://www.news24.com/News24/World/News/0,,2-10-1462\\_1399002,00.html](http://www.news24.com/News24/World/News/0,,2-10-1462_1399002,00.html)

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<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: July 29 EPW hearing

From: "Michael E. Mann" <mann@virginia.edu>

Date: 8/8/03 2:30 PM

To: Mike MacCracken <mmaccrac@comcast.net>, Michael Oppenheimer <omichael@Princeton.EDU>, rbradley@geo.umass.edu, mhughes@ltrr.arizona.edu, Tom Wigley <wigley@ucar.edu>, Kevin Trenberth <trenbert@ucar.edu>, Phil Jones <p.jones@uea.ac.uk>, Jonathan Overpeck <jto@u.arizona.edu>, Ellen Mosley-Thompson <thompson.4@osu.edu>, Steve Schneider <shs@stanford.edu>, Stefan Rahmstorf <rahmstorf@pik-potsdam.de>, Eric Steig <steig@ess.washington.edu>, Tom Crowley <tcrowley@duke.edu>, Ben Santer <santer1@llnl.gov>

Dear colleagues,

The July 29 Senate EPW hearing on climate is available in "Real Audio" format here  
[http://www.epw.senate.gov/audio-visual\\_media\\_108.htm](http://www.epw.senate.gov/audio-visual_media_108.htm)

or more directly, here:

<http://www.epw.senate.gov/epw072903.ram>

best regards,

Mike

---

Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

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e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: Mann and Jones (GRL)

From: "Michael E. Mann" <mann@virginia.edu>

Date: 8/14/03 6:53 AM

To: Phil Jones <p.jones@uea.ac.uk>, rbradley@geo.umass.edu, Malcolm Hughes <mhughes@ltrr.arizona.edu>, Scott Rutherford <srutherford@gso.uri.edu>, Caspar Ammann <ammann@ucar.edu>, Kevin Trenberth <trenbert@ucar.edu>, Tom Crowley <tcrowley@duke.edu>, Tom Wigley <wigley@ucar.edu>, Gabi Hegerl <hegerl@duke.edu>, Keith Briffa <k.briffa@uea.ac.uk>, Tim Osborn <t.osborn@uea.ac.uk>, Michael Oppenheimer <omichael@princeton.edu>, Mike MacCracken <mmaccrac@comcast.net>, Mark Eakin <Mark.Eakin@noaa.gov>, Tas van Ommen <tas.van.ommen@utas.edu.au>, Ellen Mosley-Thompson <thompson.4@osu.edu>, Eric Steig <steig@ess.washington.edu>, thompson.3@osu.edu, drdendro@ldeo.columbia.edu, tcronin@usgs.gov, j.salinger@niwa.co.nz, jto@u.arizona.edu, dverardo@nsf.gov, Christopher.d.miller@noaa.gov, ben Santer <santer1@llnl.gov>, Steve Schneider <shs@stanford.edu>, Michael Schlesinger <schlesin@atmos.uiuc.edu>, Natasha@atmos.uiuc.edu

CC: rpomerance@aecs-inc.org, asocci@cox.net, Andy Revkin <anrevk@nytimes.com>, Jeff Nesmith <jeffn@coxnews.com>, David Appell <appell@nasw.org>, Chris\_Miller@epw.senate.gov, Johannes\_Loschnigg@lieberman.senate.gov, arappaport@ucsusa.org, ben Santer <santer1@llnl.gov>, mcarey@environmentaldefense.org

Dear Colleagues,

FYI, the following article has just appeared in GRL, and is available online:

Mann, M.E., Jones, P.D., Global surface temperature over the past two millennia, Geophysical Research Letters, 30 (15), 1820, doi: 10.1029/2003GL017814, 2003.

It can be downloaded (pdf format) here:

<ftp://holocene.evsc.virginia.edu/pub/mann/mannjones03.pdf>

best regards,

mike

---

Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

---

e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: Re: seminar dates  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 9/5/03 3:14 PM  
To: mhughes@ltrr.arizona.edu

HI Malcolm,

Actually, Feb 12 is already taken by one of our graduate students...

mike

At 06:12 PM 9/5/2003 -0400, Michael E. Mann wrote:

> HI Malcolm,

>

> Here are the possible dates (I've eliminated three dates: Feb 26, since I'll be at CLIVAR workshop, and March 25 when I'll be at GSA meeting in DC, and April 8 which is when your Tucson meeting happens I think).

>

> The remaining possible dates are Jan 22, 29, Feb 5, 12, 19, Mar 4, 18, 25, Apr 1, 15, 22).

>

> Let me know which looks the best and I'll reserve it...

>

> hope you have a good weekend,

>

> mike

>

>

>

>

>

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> Professor Michael E. Mann  
> Department of Environmental Sciences, Clark Hall  
> University of Virginia  
> Charlottesville, VA 22903

>

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> e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137  
> <http://www.evsc.virginia.edu/faculty/people/mann.shtml>

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Charlottesville, VA 22903

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e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: seminar dates  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 9/5/03 3:12 PM  
To: mhughes@ltrr.arizona.edu  
CC: mann@virginia.edu

HI Malcolm,

Here are the possible dates (I've eliminated three dates: Feb 26, since I'll be at CLIVAR workshop, and March 25 when I'll be at GSA meeting in DC, and April 8 which is when your Tucson meeting happens I think).

The remaining possible dates are Jan 22, 29, Feb 5, 12, 19, Mar 4, 18, 25, Apr1, 15, 22).

Let me know which looks the best and I'll reserve it..

hope you have a good weekend,

mike

---

Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

---

e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: FYI  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 9/12/03 5:17 AM  
To: mann@virginia.edu

Dear Colleagues,

From today's "Harvard Crimson",

online link here:

<http://www.thecrimson.com/article.aspx?ref=348723>

cheers,

Mike M

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Published on Friday, September 12, 2003  
Warming Study Draws Fire  
Harvard scientists accused of politicizing research

By IRENE SANCHEZ  
Contributing Writer

A study by two Harvard researchers quietly published last January in a small research journal has set off a political storm that has led to debate on the senate floor and internal wrangling at the Environmental Protection Agency (EPA).

The study, co-authored by two scientists at the Harvard-Smithsonian Center for Astrophysics, concluded that the 20th century has been neither the warmest century of the past millennium nor the one with the most extreme weather.

Disbelievers in global warming the widely-accepted scientific theory that the earth has grown incrementally hotter over the past century, in large part due to pollution have used the study to bolster their case.

But a large number of scientists have criticized the study's methods and pointed to ties between the oil industry and the study's authors, Willie Soon and Sallie Baliunas.

Approximately 5 percent of the study's funding about \$53,000 in all came from the American Petroleum Institute, the gas and oil industry's main trade organization.

Both Soon and Baliunas are paid consultants for the George C. Marshall Institute, a Washington non-profit organization that opposes limits on carbon dioxide emissions.

Four editors have resigned from Climate Research, the small journal that initially published the study. According to The New York Times, even the publisher of the journal, Otto Kinne, has criticized the study.

I have not stood behind the paper by Soon and Baliunas, Kinne said, according to the Times. Indeed: the reviewers failed to detect methodological flaws.

But despite wide debate in the scientific world over the study's legitimacy, the research has become a hot document in Washington.

According to internal EPA documents leaked to the national media, the Bush administration tried to include references

to the study in the agency's report on the state of the environment.

To block this move, EPA staffers deleted the global warming section from its report.

The research also caught the eye of Senator James Inhofe, R-Okla., who chairs the Senate Environment and Public Works Committee, which copied and distributed the work.

He called for a hearing in late July to debate the issue, and praised the study's findings in his opening remarks.

The 1,000-year climate study that the Harvard-Smithsonian Center for Astrophysics has compiled is a powerful, new work of science. It has received much attention, and rightfully so, Inhofe said. The powerful new findings of this most comprehensive of studies shiver the timbers of the adrift Chicken Little crowd.

Professor Michael Mann of the University of Virginia, who testified before the Senate Committee, denounced the study in an interview yesterday.

Serious scientists will tell you over and over again that this was a deeply flawed study that should never have been published, Mann said. Scientifically this study was considered not even worthy of a response. But because it was used politically, to justify policy changes in the administration, people in my field felt they had to speak out.

Harvard professors have also criticized the report.

My impression is that the critics are right, said John Holdren, Heinz professor of environmental policy at the Kennedy School of Government. It's unfortunate that so much attention is paid to a flawed analysis, but that's what happens when something happens to support the political climate in Washington.

Professor Daniel Schrag of the Department of Earth and Planetary Sciences said that he did not think Soon and Baliunas' approach to finding a global average temperature was as honest as other approaches.

The bottom line is that this paper is suggesting that the unusually warm weather we've been having for the last 100 years is part of natural variability, he said. We have observations to show that that's not the case.

The Harvard-Smithsonian Center for Astrophysics' director was on vacation and could not be reached.

Soon would only discuss the science, not the politics of the report for this article.

But he did defend his scientific position.

I don't want to say any harsh words, Soon said. I just say this: the key point is to encourage more research.

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e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: ground and air temperature coupling  
From: "raymond s. bradley" <rbradley@geo.umass.edu>  
Date: 9/12/03 8:32 PM  
To: wdmccoy@geo.umass.edu, mann@multiproxy.evsc.virginia.edu, kehrwald@geo.umass.edu, mhughes@ltr.arizona.edu, srutherford@gso.uri.edu

<[http://www.sciencedirect.com/science?\\_ob=JournalURL&\\_cdi=5996&\\_auth=y&\\_acct=C000050221&\\_version=1&\\_urlVersion=0&\\_userid=10&md5=a6b76bd92e41ed728cd5522274ed70e0](http://www.sciencedirect.com/science?_ob=JournalURL&_cdi=5996&_auth=y&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=a6b76bd92e41ed728cd5522274ed70e0)>Global and Planetary Change  
<[http://www.sciencedirect.com/science?\\_ob=IssueURL&\\_tockey=%23TOC%235996%232003%23999619996%23451595%23FLA%23display%23Volume\\_38,\\_Issues\\_3-4,\\_Pages\\_223-344\\_%28September\\_2003%29%23tagged%23Volume%23first%3D38%23Issues%23first%3D3%23last%3D4%23span%3D2%23Pages%23first%3D223%23last%3D344%23date%23%28September\\_2003%29%23&\\_auth=y&view=c&\\_acct=C000050221&\\_version=1&\\_urlVersion=0&\\_userid=10&md5=4d134d8cc05fa8e318dbd0e62b7c3588](http://www.sciencedirect.com/science?_ob=IssueURL&_tockey=%23TOC%235996%232003%23999619996%23451595%23FLA%23display%23Volume_38,_Issues_3-4,_Pages_223-344_%28September_2003%29%23tagged%23Volume%23first%3D38%23Issues%23first%3D3%23last%3D4%23span%3D2%23Pages%23first%3D223%23last%3D344%23date%23%28September_2003%29%23&_auth=y&view=c&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=4d134d8cc05fa8e318dbd0e62b7c3588)>Volume 38, Issues 3-4 , September 2003, Pages 291-303

See:  
[http://www.sciencedirect.com/science?\\_ob=ArticleURL&\\_udi=B6VF0-49FXHHS-1&\\_coverDate=09%2F30%2F2003&\\_alid=112940926&\\_rdoc=1&\\_fmt=&\\_orig=search&\\_qd=1&\\_cdi=5996&\\_sort=d&\\_view=c&\\_acct=C000050221&\\_version=1&\\_urlVersion=0&\\_userid=10&md5=51c7d3ed0c6443731c0a03e27586f2d0](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VF0-49FXHHS-1&_coverDate=09%2F30%2F2003&_alid=112940926&_rdoc=1&_fmt=&_orig=search&_qd=1&_cdi=5996&_sort=d&_view=c&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=51c7d3ed0c6443731c0a03e27586f2d0)

Raymond S. Bradley  
Distinguished Professor  
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Department of Geosciences  
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AMHERST, MA 01003-9297

Tel: 413-545-2120  
Fax: 413-545-1200  
\*Climate System Research Center: 413-545-0659

<<http://www.paleoclimate.org>>  
Paleoclimatology Book Web Site: <http://www.geo.umass.edu/climate/paleo/html>

Subject: Re: seminar dates  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 9/12/03 5:33 PM  
To: "Malcolm Hughes" <mhughes@ltrr.arizona.edu>

Malcolm,

That date looks good. I'm going ahead and penciling it in, so let me know if anything comes up. Otherwise, lets consider that the date. Hopefully you can visit for at least a few days--you're welcome to stay at our place by the way. We have a guest room (and its internet ready!)...We can try to finalize the plans later...

rainy and miserable here tonight. Hope its better out there. talk to you later,

mike

At 05:25 PM 9/12/2003 -0700, Malcolm Hughes wrote:

> hI mIKE - HOW ABOUT mARCH 18? cHEERS, mALCOLM> HI Malcolm,  
> >

> > Here are the possible dates (I've eliminated three dates: Feb 26,  
> > since I'll be at CLIVAR workshop, and March 25 when I'll be at GSA  
> > meeting in DC, and April 8 which is when your Tucson meeting happens I  
> > think).

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> > 25, Apr1, 15, 22).

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> > Let me know which looks the best and I'll reserve it...

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> > hope you have a good weekend,

> >  
> > mike

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> > \_\_\_\_\_  
> >             
> > Professor Michael E. Mann  
> > Department of Environmental Sciences, Clark Hall  
> > University of Virginia  
> > Charlottesville, VA 22903

> > \_\_\_\_\_  
> > \_ e-mail: mann@virginia.edu Phone: (434) 924-7770FAX: (434) 982-2137  
> > <http://www.evsc.virginia.edu/faculty/people/mann.shtml>

>  
> Malcolm Hughes  
> Professor of Dendrochronology  
> Laboratory of Tree-Ring Research  
> University of Arizona  
> Tucson, AZ 85721  
> 520-621-6470  
> fax 520-621-8229

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e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: Re: ground and air temperature coupling

From: "Michael E. Mann" <mann@virginia.edu>

Date: 9/13/03 6:59 AM

To: "raymond s. bradley" <rbradley@geo.umass.edu>, wdmccoy@geo.umass.edu, kehrwald@geo.umass.edu, mhughes@ltrr.arizona.edu, srutherford@gso.uri.edu

Thanks Ray,

Hugo sent me a copy of the paper. Its quite relevant indeed, as well as this paper that appeared in GRL a couple months back that you may or may not have seen:

Stieglitz, Marc; D'Arry, S. J.; Romanovsky, V. E.; Osterkamp, T. E., The role of snow cover in the warming of arctic permafrost, Geophys. Res. Lett. Vol. 30, No. 13, 1721, 10.1029/2003GL017337, 15 July 2003.

Its nice to see that the point we've all been making about the potentially significant differences between GST and SAT is increasingly being demonstrated from a number of different process-oriented studies. The most convincing has not yet appeared, T. Zhang (an associated of Roger Barry's) has been looking at soil temperature vs. air temperature measurements across Eurasia for the 20th century--there are some dramatic differences. I think Pasha has some concerns about the Russian data, but that's par for the course...

Its wet and dreary down here this morning. Hope its a nicer day up in Amherst,

mike

At 11:32 PM 9/12/2003 -0400, raymond s. bradley wrote:

> <[http://www.sciencedirect.com/science?](http://www.sciencedirect.com/science?_ob=JournalURL&_cdi=5996&_auth=y&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=a6b76bd92e41ed728cd5522274ed70e0)

[\\_ob=JournalURL&\\_cdi=5996&\\_auth=y&\\_acct=C000050221&\\_version=1&\\_urlVersion=0&\\_userid=10&md5=a6b76bd92e41ed728cd5522274ed70e0](http://www.sciencedirect.com/science?_ob=JournalURL&_cdi=5996&_auth=y&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=a6b76bd92e41ed728cd5522274ed70e0)>Global and Planetary Change

> <[http://www.sciencedirect.com/science?](http://www.sciencedirect.com/science?_ob=IssueURL&_tockey=%23TOC%235996%232003%23999619996%23451595%23FLA%23display%23Volume_38,_Issues_3-4,_Pages_223-344_%28September_2003%29%23tagged%23Volume%23first%3D38%23Issues%23first%3D3%23last%3D4%23span%3D2%23Pages%23first%3D223%23last%3D344%23date%23%28September_2003%29%23&_auth=y&view=c&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=4d134d8cc05fa8e318dbd0e62b7c3588)

[\\_ob=IssueURL&\\_tockey=%23TOC%235996%232003%23999619996%23451595%23FLA%23display%23Volume\\_38,\\_Issues\\_3-4,\\_Pages\\_223-](http://www.sciencedirect.com/science?_ob=IssueURL&_tockey=%23TOC%235996%232003%23999619996%23451595%23FLA%23display%23Volume_38,_Issues_3-4,_Pages_223-344_%28September_2003%29%23tagged%23Volume%23first%3D38%23Issues%23first%3D3%23last%3D4%23span%3D2%23Pages%23first%3D223%23last%3D344%23date%23%28September_2003%29%23&_auth=y&view=c&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=4d134d8cc05fa8e318dbd0e62b7c3588)

[344\\_%28September\\_2003%29%23tagged%23Volume%23first%3D38%23Issues%23first%3D3%23last%3D4%23span%3D2%23Pages%23first%3D223%23last%3D344%23date%23%28September\\_2003%29%23&\\_auth=y&view=c&\\_acct=C000050221&\\_version=1&\\_urlVersion=0&\\_userid=10&md5=4d134d8cc05fa8e318dbd0e62b7c3588](http://www.sciencedirect.com/science?_ob=IssueURL&_tockey=%23TOC%235996%232003%23999619996%23451595%23FLA%23display%23Volume_38,_Issues_3-4,_Pages_223-344_%28September_2003%29%23tagged%23Volume%23first%3D38%23Issues%23first%3D3%23last%3D4%23span%3D2%23Pages%23first%3D223%23last%3D344%23date%23%28September_2003%29%23&_auth=y&view=c&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=4d134d8cc05fa8e318dbd0e62b7c3588)>Volume 38, Issues 3-4 , September 2003, Pages 291-303

> See:

> [http://www.sciencedirect.com/science?\\_ob=ArticleURL&\\_udi=B6VF0-49FXHHS-](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VF0-49FXHHS-1&_coverDate=09%2F30%2F2003&_alid=112940926&_rdoc=1&_fmt=&_orig=search&_qd=1&_cdi=5996&_sort=d&_view=c&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=51c7d3ed0c6443731c0a03e27586f2d0)

[1&\\_coverDate=09%2F30%2F2003&\\_alid=112940926&\\_rdoc=1&\\_fmt=&\\_orig=search&\\_qd=1&\\_cdi=5996&\\_sort=d&\\_view=c&\\_acct=C000050221&\\_version=1&\\_urlVersion=0&\\_userid=10&md5=51c7d3ed0c6443731c0a03e27586f2d0](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VF0-49FXHHS-1&_coverDate=09%2F30%2F2003&_alid=112940926&_rdoc=1&_fmt=&_orig=search&_qd=1&_cdi=5996&_sort=d&_view=c&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=51c7d3ed0c6443731c0a03e27586f2d0)

>

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<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: Interesting Information

From: "Michael E. Mann" <mann@virginia.edu>

Date: 9/30/03 10:16 PM

To: Phil Jones <p.jones@uea.ac.uk>, Mike MacCracken <maccrac@comcast.net>, Michael Oppenheimer <omichael@Princeton.EDU>, "raymond s. bradley" <rbradley@geo.umass.edu>, mhughes@ltrr.arizona.edu, Tom Wigley <wigley@ucar.edu>, Jonathan Overpeck <jto@u.arizona.edu>, Kevin Trenberth <trenbert@cgd.ucar.edu>, "Socci.Tony-epamail.epa.gov" <Socci.Tony@epamail.epa.gov>, Stephen H Schneider <shs@stanford.edu>, Ben Santer <santer1@llnl.gov>, Stefan Rahmstorf <rahmstorf@pik-potsdam.de>, Eric Steig <steig@geophys.washington.edu>, tom crowley <tom@ocean.tamu.edu>, Gabi Hegerl <hegerl@duke.edu>

Dear Colleagues,

David Appell (freelance journalist for 'Scientific American' and other venues) has been keeping a very interesting web log regarding the various developments with "Climate Research" and matters involving the skeptics in general:

<http://www.davidappell.com/>

Its worth following!

cheers,

mike

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Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

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e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: FW: Controversy swirls around climate study

From: "Michael E. Mann" <mann@virginia.edu>

Date: 10/6/03 12:22 PM

To: Tom Wigley <wigley@ucar.edu>, tom crowley <tom@ocean.tamu.edu>, rbradley@geo.umass.edu, Phil Jones <p.jones@uea.ac.uk>, Tim Osborn <t.osborn@uea.ac.uk>, Kevin Trenberth <trenbert@cgd.ucar.edu>, Keith Briffa <k.briffa@uea.ac.uk>, Scott Rutherford <srutherford@rwu.edu>, Michael Oppenheimer <omichael@Princeton.EDU>, Jonathan Overpeck <jto@u.arizona.edu>, Caspar Ammann <ammann@ucar.edu>, mhughes@ltrr.arizona.edu, mann@virginia.edu

FYI...

Mike

> Delivered-To: mem6u@virginia.edu

> User-Agent: Microsoft-Outlook-Express-Macintosh-Edition/5.02.2022

> Date: Mon, 06 Oct 2003 15:07:37 -0400

> Subject: FW: Controversy swirls around climate study

> From: Mike MacCracken <mmaccrac@comcast.net>

> To: Michael Mann <mann@virginia.edu>

>

>

>

> -----

> From: "Nicholas Sundt" <nsundt@usgcrp.gov>

> Reply-To: <nsundt@usgcrp.gov>

> Date: Mon, 6 Oct 2003 14:49:04 -0400

> To: <nsundt@usgcrp.gov>

> Subject: Controversy swirls around climate study

>

> From the Toronto Star, 5 Oct 2003

>

>

> [http://www.thestar.com/NASApp/cs/ContentServer?pagename=thestar/Layout/Article\\_Type1&c=Article&cid=1065264690573&call\\_pageid=968332188774&col=9683501164](http://www.thestar.com/NASApp/cs/ContentServer?pagename=thestar/Layout/Article_Type1&c=Article&cid=1065264690573&call_pageid=968332188774&col=9683501164)

> le\_Type1&c=Article&cid=1065264690573&call\_pageid=968332188774&col=9683501164

> 67

>

> Oct. 5, 2003. 10:34 AM

>

> Controversy swirls around climate study

>

>

> JAY INGRAM

>

> This past summer a Harvard climate study made headlines by claiming that we

> are not living in the warmest period in recorded history. The paper argued

> that temperatures were higher in medieval times than they are now, and so

> claims of recent extremes in global warming were exaggerated. The study has

> made headlines, but the fallout from it has not, and that fallout is much

> more interesting.

>

> The paper qualified as a Harvard study because the two authors, Willie Soon

> and Sally Baliunas, are both at the Harvard Smithsonian Center for

> Astrophysics. However, the research has less to do with astrophysics than

> the fact that both are ardent opponents not only of the Kyoto accord but of  
> the very idea that we are warming the planet.

>

> In their paper, which was first published in a journal called Climate  
> Research in January, Soon and Baliunas presented data showing that the  
> warming of the last few decades "which Kyoto proponents view as  
> unprecedented" is no greater than that which occurred around 1000 A.D.

>

> The implication was clear: If extremes of warmth have happened before, we  
> are likely in the middle of some sort of warm/cold cycle, and limiting  
> carbon dioxide emissions would be useless and foolish.

>

> Unfortunately for the global-warming skeptics, the Soon-Baliunas thesis has  
> fallen apart in the months since its publication. Shortly after it appeared  
> in print, a group of climate scientists in the United States took the  
> unusual step of publishing a direct critique of the paper, showing that  
> while Soon and Baliunas did present data, those data couldn't be used to  
> support the conclusions they drew.

>

> It is true that in certain places at narrowly-defined times in the past,  
> warm periods correlated with changes in precipitation. But Soon and Baliunas  
> took the extraordinary and scientifically illegitimate step of defining  
> evidence for warmth in medieval times as any 50-year period of warmth,  
> wetness or drought "anywhere" between 800 A.D. and 1300 A.D. So warmth in  
> China in 850 and wet in England in 1200 both qualified as evidence for the  
> so-called Medieval Warm period, a claim that experts found laughable.

>

> Other researchers claimed that their data had been misrepresented by Soon  
> and Baliunas. This critique should have been embarrassing enough for the two  
> authors, but what followed was even worse.

>

> The editor of Climate Research, the journal in which the paper was  
> originally published, concluded that it should have never seen the light of  
> day, and that the journal's reviewing process was flawed. It is the job of  
> reviewers to spot errors and request revisions before a paper is ever  
> published.

>

> The editor, Hans von Storch, submitted a letter to his publisher arguing for  
> changes in reviewing, but the publisher refused, and von Storch, along with  
> three other editors of the journal, resigned. Now even the publisher has  
> concluded that the paper shouldn't have been published.

>

> Soon and Baliunas have been global-warming skeptics for years, and this  
> isn't the first time they have been at the centre of controversy. In 1998,  
> they were among the authors of an article that was circulated to scientists  
> in the United States, along with a plea to sign an anti-Kyoto petition. The  
> article, which not only argued that the evidence for global warming was  
> non-existent, but added that carbon dioxide emissions "will help to maintain  
> and improve the health, longevity, prosperity and productivity of all  
> people" was in no way a scientific report, but had all the earmarks of one.

>

> In fact, it was formatted to be identical in appearance to reports published  
> in the prestigious Proceedings of the National Academy of Sciences. The  
> resemblance was so striking that the National Academy felt it necessary to

> issue a blunt disclaimer, pointing out that manuscript hadn't been published  
> in any peer-reviewed journal and that the accompanying petition "does not  
> reflect the conclusions of expert reports of the Academy."

> I've said it before, and I'll say it again. All the public really wants is  
> that the scientists involved in the global-warming debate give us the  
> straight goods. Impressive academic affiliations, the "scientific"  
> appearance of a report, and even a publication in a scientific journal are  
> no guarantee of that.

> -----

> ----  
> Jay Ingram hosts the Daily Planet program on Discovery Channel.

> [DEFAULT]  
> BASEURL=[http://www.thestar.com/NASApp/cs/ContentServer?  
pagename=thestar/Layout/Article\\_Type1&c=Article&cid=1065264690573&call\\_pageid=968332188774&col=9683501  
16467](http://www.thestar.com/NASApp/cs/ContentServer?pagename=thestar/Layout/Article_Type1&c=Article&cid=1065264690573&call_pageid=968332188774&col=968350116467)

> [InternetShortcut]  
> URL=[http://www.thestar.com/NASApp/cs/ContentServer?  
pagename=thestar/Layout/Article\\_Type1&c=Article&cid=1065264690573&call\\_pageid=968332188774&col=9683501  
16467](http://www.thestar.com/NASApp/cs/ContentServer?pagename=thestar/Layout/Article_Type1&c=Article&cid=1065264690573&call_pageid=968332188774&col=968350116467)  
> Modified=405DDD583A8CC3015C

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Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

---

e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: spring seminar  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 10/7/03 4:00 PM  
To: mhughes@ltrr.arizona.edu

Hi Malcolm,

Just as a reminder, I've secured the March 18th Thursday seminar slot for you this spring.

At your leisure, can you provide me w/ a title and abstract?

Thanks in advance,

mike

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Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

---

e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: Science piece  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 10/14/03 6:22 AM  
To: rbradley@geo.umass.edu, mhughes@ltrr.arizona.edu, hfd@ncdc.noaa.gov

Guys,

Malcolm just sent the "Science" piece, looks great! I plan to introduce your figure into my standard "past 1000 years" talk now...Simple perhaps, but very clear and very telling. I'm glad to emphasized the warming of the past 30 years-- that's something the septics (my new word for them) just love to muddle.

Will keep it under wraps until the embargo is lifted. Do you plan to do any press on this?

Thanks again for undertaking this and doing such a nice job,

cheers,

mike

---

Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

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e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: Fwd: postdoc position at Stockholm University  
From: "raymond s. bradley" <rbradley@geo.umass.edu>  
Date: 10/21/03 2:28 PM  
To: mann@multiproxy.evsc.virginia.edu, mhughes@ltrr.arizona.edu

>  
> STOCKHOLM UNIVERSITY  
> The Department of Physical Geography & Quaternary Geology and the Department of Meteorology jointly announce:  
>  
> Two-year position as  
> POSTDOCTORAL FELLOW IN PALEOCLIMATOLOGY  
> (Ref. No. 618-2099-03)  
> within the research project "A 2000-year climate reconstruction for Sweden"  
>  
> Starting date February 1, 2004 or as soon as possible.  
>  
> The position will involve: establishment of a data base with instrumental and proxy climate records; statistical evaluation of individual proxy series; statistical reconstruction of climate in Sweden for the last 2000 years; comparative evaluation of both reconstructed climate data and data from long integrations with a regional climate model nested to a global model.  
>  
> The position will be placed at the Department of Physical Geography & Quaternary Geology, but the successful applicant will work in close collaboration with the Department of Meteorology and with the Rossby Centre at the Swedish Meteorological and Hydrological Institute. The project is funded by the Swedish Nuclear Fuel and Waste Management Company (SKB). The goal of the research conducted by SKB is to help us understand the long-term changes that take place in a deep repository and how they affect the repository's ability to isolate the spent nuclear fuel.  
>  
> Applicants should have a PhD in a field related to Climatology/Paleoclimatology/Quaternary Geology/Climate Modelling. Applicants should also have strong competence in multivariate techniques that are frequently used for paleoclimate reconstructions.  
>  
> Applications should contain:  
> - Verified curriculum vitae  
> - Verified copies of PhD diploma and graduation certificates  
> - Letter of intent  
> - 5 Copies of recent publications  
> - Addresses of three referees  
>  
> For further inquiries please contact Barbara Wohlfarth, Department of Physical Geography & Quaternary Geology, e-mail: Barbara@geo.su.se ; Anders Moberg, Department of Meteorology, e-mail: anders@misu.su.se ; Markku Rummukainen, Rossby Centre, SMHI, markku.rummukainen@smhi.se. Trade unions: Bo Ekengren, SACO, Lars-Åke Sjöll, ST/ATF and Birgitta Carlsson, SEKO, Phone: + 46 8 16 20 00.  
> The application for the position as Postdoc, labelled "Ref. no. 618-2099-03", must arrive at the following address no later than 30 November, 2003.  
> Stockholm University  
> Registrator/PÅ,,  
> SE-106 91 STOCKHOLM  
> SWEDEN  
> Facsimile: + 46 8 16 38 66  
> Email: registrator@adm.su.se

> If the application arrives by facsimile or email, an identical and signed original application should follow promptly by ordinary mail.

>

> Barbara Wohlfarth  
> Department of Physical Geography & Quaternary Geology  
> Stockholm University  
> SE-106 91 Stockholm  
> Tel. +46-(0)8-16 48 83  
> Fax +46-(0)8-674 78 95  
> e-mail: [Barbara@geo.su.se](mailto:Barbara@geo.su.se)  
> <http://www.geol.lu.se/personal/BAW/ehome.html>

Raymond S. Bradley  
Distinguished Professor  
Director, Climate System Research Center\*  
Department of Geosciences  
Morrill Science Center  
611 North Pleasant Street  
AMHERST, MA 01003-9297

Tel: 413-545-2120

Fax: 413-545-1200

\*Climate System Research Center: 413-545-0659

<<http://www.paleoclimate.org>>

Paleoclimatology Book Web Site: <http://www.geo.umass.edu/climate/paleo/html>

Subject: Re: Request for Permission to use Graph  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 10/26/03 6:08 AM  
To: "Karen Frecker" <karen.frecker@utoronto.ca>, mann@virginia.edu, rbradley@geo.umass.edu, mhughes@ltrr.arizona.edu

Dear Karen,

Thanks for your message.

You have my blessing in using the figure. We'd like you, if possible, to cite the original article in which the figure appeared however:

Mann, M.E., Bradley, R.S. and Hughes, M.K., Northern Hemisphere Temperatures During the Past Millennium: Inferences, Uncertainties, and Limitations, *Geophysical Research Letters*, 26, 759-762, 1999.

The American Geophysical Union, who published the journal, allows reprinting of figures w/ out any required additional permissions from them as long as the article is properly cited, and the AGU copyright is acknowledged.

The version of the figure that appeared in the New York Times article might require permission from them. An alternative version of the Figure appeared in the "summary for policy makers" of the 2001 report of the Intergovernmental Panel on Climate Change, "Climate Change 2001: The Scientific Basis", published by Cambridge University Press, and is available electronically here:  
[http://www.grida.no/climate/ipcc\\_tar/wg1/figspm-1.htm](http://www.grida.no/climate/ipcc_tar/wg1/figspm-1.htm)

I believe they allow reprinting of figures as long as the source and copyright are cited.

Please let us know if we can be of any further assistance.

best regards,

mike mann

At 11:21 PM 10/25/2003 -0400, Karen Frecker wrote:

> Dear Doctors Mann, Bradley, and Hughes:

>

>

>

> I am a research assistant to Professor Thomas Homer-Dixon at the Centre for the Study of Peace and Conflict, University of Toronto. I am writing to request permission to use a graph that you provided to the New York Times (Mar 9 1999, Science Section, D5), entitled A Thousand Years of Chills and Fevers. The graph appeared alongside an article written by William Stevens entitled Song of the Millennium: Cool Prelude and a Fiery Coda.

>

>

>

> Professor Homer-Dixon is writing a book and, with your permission, would like to include this graph. If possible, we would very much appreciate it if we could obtain the data from which the graph was constructed.

>

>

>

> Please do let me know if there are any fees that need to be paid upfront in order to use this source, or if you require

any further information regarding Professor Homer-Dixons work.

>

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>

> Best Regards,

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> Karen

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>

> Karen Frecker

>

> Research Assistant

>

> Centre for the Study of Peace and Conflict

>

> University of Toronto

>

> ph: 416.579.2664

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> e-mail: karen.frecker@utoronto.ca

>

>

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Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

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e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: From: "Michael E. Mann" <mann@virginia.edu>  
Date: 10/29/03 12:39 PM  
To: editor@usatoday.com

October 29, 2003 2:30 p.m.  
Editor, USA Today

We write to address false statements in the piece "Researchers question key global-warming study" (USA Today, October 29, 2003), by Nick Schulz of TechCentralStation. We also wish to inform your readers that late 20th century warming is unprecedented not only in the past six centuries (as shown by Mann and colleagues in 1998), but at least the past two millennia (see attached graph, which we request that you publish).

Mr. Schulz makes the false accusation that Dr. Michael Mann, lead author of the leading studies on 20th century warming, "never made his data available online nor did many of the earlier researchers whose data Mann relied upon for his research." In fact, the data used by Mann and colleagues have been in the public domain for nearly two years, at the readily accessible website: <ftp://holocene.evsc.virginia.edu/pub/MBH98/>.

Mr. Schulz draws on a recent article by Stephen McIntyre and Ross McKittrick that appears to contradict Mann's earlier work and the conclusion that the Northern Hemisphere is warming. Unfortunately, the data on which the McIntyre & McKittrick analysis was based, which was forwarded to them by a colleague of Mann's at the request of McIntyre & McKittrick, was inadvertently scrambled during tabulation for transmission to them, rendering the data for earlier centuries useless. Had McIntyre and McKittrick directly downloaded the data from the publicly available website which they were encouraged to do by Mann's team this would not have occurred.

McIntyre & McKittrick then applied a flawed methodology to the scrambled data, and reached mistaken conclusions wildly at odds with the many peer-reviewed scientific studies.

Had the researchers themselves been experts, had they sought comments in advance from experts in the field (including Dr. Mann), had they submitted their paper to a reputable scientific journal all of which are standard procedures in scientific publication, the flaws would have been discovered. Instead, the authors, who are not scientists - one is a mining executive, the other an economist - published their article in a social science magazine that does not apply widely accepted standards of review by scientific experts.

Had Mr Schultz followed the standard procedure of getting his article reviewed, it would have become apparent that there was a problem with his story. Considering how such inaccuracies are propagated, it is perhaps relevant that Mr. Schulz's website, TechCentralStation.com, receives considerable funding from Exxon-Mobil, a corporation that has lobbied aggressively against caps on greenhouse gas emissions at home and abroad. In contrast, the notion that the Earth is warming has been endorsed not only by the United Nations Intergovernmental Panel on Climate Change (IPCC) but also by the United States National Academy of Sciences, in a report prepared at the request of President George Bush.

Michael Mann, Professor, Dept. of Environmental Sciences, University of Virginia, Charlottesville, VA.  
Raymond Bradley, Professor, Dept. of Geosciences, University of Massachusetts, Amherst, MA.  
Keith Briffa, Philip Jones, Professors, Climatic Research Unit, University of East Anglia, Norwich, UK.  
Malcolm Hughes, Professor, Laboratory of Tree-Ring Research, University of Arizona, Tucson, AZ.

AUTHOR CONTACT INFORMATION:

Michael Mann  
Office: (434) 924-7770  
Cell: [REDACTED]

Raymond Bradley

Office: (413) 545-2120  
Home: (413) 253-7058

Philip Jones  
+44 (0) 1603 592090

---

Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

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e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Attachments:  
oped29oct03.doc 116 KB  
figure1.pdf 103 KB

Subject: RE: Request for Permission to use Graph

From: "Michael E. Mann" <mann@virginia.edu>

Date: 10/31/03 12:54 PM

To: "Karen Frecker" <karen.frecker@utoronto.ca>, <rbradley@geo.umass.edu>, <mhughes@ltrr.arizona.edu>

HI Karen,

Yes, they should be here:

[http://www.ngdc.noaa.gov/paleo/ei/ei\\_millenm.html](http://www.ngdc.noaa.gov/paleo/ei/ei_millenm.html)

best regards,

Mike

At 02:47 PM 10/31/2003 -0500, Karen Frecker wrote:

> Dear Dr. Mann,

>

>

>

> Thank you very much for your response. I believe the graph we are interested in is Figure 3a on page 761 I am just double checking this with Professor Homer-Dixon. Are the data that underpin this particular graph also available from the <http://www.ngdc.noaa.gov/paleo/paleo.html> website?

>

>

>

> Thank you very much for your assistance.

>

>

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> Best Regards,

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> Karen

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> Karen Frecker

>

> Research Assistant

>

> Centre for the Study of Peace and Conflict

>

> University of Toronto

>

> ph: 416.579.2664

>

> e-mail: karen.frecker@utoronto.ca

>

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>

> -----Original Message-----

> From: Michael E. Mann [mailto:mann@virginia.edu]

> Sent: Sunday, October 26, 2003 8:08 AM

> To: Karen Frecker; mann@virginia.edu; rbradley@geo.umass.edu; mhughes@ltrr.arizona.edu

> Subject: Re: Request for Permission to use Graph

>

>

>

> Dear Karen,

>

> Thanks for your message.

>

> You have my blessing in using the figure. We'd like you, if possible, to cite the original article in which the figure appeared however:

>

> Mann, M.E., Bradley, R.S. and Hughes, M.K., Northern Hemisphere Temperatures During the Past Millennium: Inferences, Uncertainties, and Limitations, Geophysical Research Letters, 26, 759-762, 1999.

>

> The American Geophysical Union, who published the journal, allows reprinting of figures w/ out any required additional permissions from them as long as the article is properly cited, and the AGU copyright is acknowledged.

>

> The version of the figure that appeared in the New York Times article might require permission from them. An alternative version of the Figure appeared in the "summary for policy makers" of the 2001 report of the Intergovernmental Panel on Climate Change, "

>

> Climate Change 2001: The Scientific Basis", published by Cambridge University Press, and is available electronically here:

>

>

> [http://www.grida.no/climate/ipcc\\_tar/wg1/figspm-1.htm](http://www.grida.no/climate/ipcc_tar/wg1/figspm-1.htm)

>

> I believe they allow reprinting of figures as long as the source and copyright are cited.

>

> Please let us know if we can be of any further assistance.

>

> best regards,

>

> mike mann

>

> At 11:21 PM 10/25/2003 -0400, Karen Frecker wrote:

>

>

> Dear Doctors Mann, Bradley, and Hughes:

>

>

>

> I am a research assistant to Professor Thomas Homer-Dixon at the Centre for the Study of Peace and Conflict, University of Toronto. I am writing to request permission to use a graph that you provided to the New York Times (Mar 9 1999, Science Section, D5), entitled A Thousand Years of Chills and Fevers. The graph appeared alongside an article written by William Stevens entitled Song of the Millennium: Cool Prelude and a Fiery Coda.

>

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>

> Professor Homer-Dixon is writing a book and, with your permission, would like to include this graph. If possible,

we would very much appreciate it if we could obtain the data from which the graph was constructed.

>

>

>

> Please do let me know if there are any fees that need to be paid upfront in order to use this source, or if you require any further information regarding Professor Homer-Dixons work.

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>

> Thank you very much for any assistance you may be able to give in this matter.

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> Best Regards,

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> Karen

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Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

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> e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137

> <http://www.evsc.virginia.edu/faculty/people/mann.shtml>

---

Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

---

e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137

<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: E&E paper responses

From: "Michael E. Mann" <mann@virginia.edu>

Date: 11/1/03 11:50 AM

To: cfk@lanl.gov, berger@astr.ucl.ac.be, ammann@ucar.edu, david@atmos.washington.edu, davet@atmos.colostate.edu, wuebbles@atmos.uiuc.edu, dshindell@giss.nasa.gov, gavin@isis.giss.nasa.gov, drdendro@ldeo.columbia.edu, druidrd@ldeo.columbia.edu, mcane@ldeo.columbia.edu, thompson.3@osu.edu, thompson.4@osu.edu, dstahle@uark.edu, dmeko@ltrr.arizona.edu, alexeyk@ldeo.columbia.edu, tswnam@ltrr.arizona.edu, gzielinski@maine.edu, dstahle@uark.edu, woodhous@ngdc.noaa.gov, joos@climate.unibe.ch, hegerl@acpub.duke.edu, meehl@ncar.ucar.edu, jlean@ssd5.nrl.navy.mil, hpollack@umich.edu, hugo@stfx.ca, jouzel@lsce.saclay.cea.fr, jhansen@giss.nasa.gov, jan.esper@wsl.ch, jcole@geo.arizona.edu, jhc@dmi.dk, juerg@giub.unibe.ch, jto@u.arizona.edu, jri@glos.ac.uk, j.haigh@ic.ac.uk, walsh@atmos.uiuc.edu, jfbmitchell@metoffice.com, jls@princeton.edu, penner@umich.edu, juerg.beer@eawag.ch, trenbert@ucar.edu, kcobb@gps.caltech.edu, loutre@astr.ucl.ac.be, claussen@pik-potsdam.de, marty.hoffert@nyu.edu, huberm@purdue.edu, glantz@ucar.edu, mprather@uci.edu, omichael@princeton.edu, mlatif@ifm.uni-kiel.de, myles.allen@physics.ox.ac.uk, ckfolland@meto.gov.uk, desanker@virginia.edu, Peter.stott@metoffice.com, Peter.Laut@fysik.dtu.dk, pth@dmi.dk, anthes@ucar.edu, mhughes@ltrr.arizona.edu, rbradley@geo.umass.edu, ralley@essc.psu.edu, Richard.Moss@pnl.gov, seager@ldeo.columbia.edu, dunbar@stanford.edu, robert.berner@yale.edu, Ronald.Stouffer@noaa.gov, td@gfdl.gov, sfbtett@metoffice.com, s.raper@uea.ac.uk, sgw@atmos.washington.edu, shs@stanford.edu, sburns@geo.umass.edu, ssolomon@al.noaa.gov, cubasch@zedat.fu-berlin.de, Hans.von.Storch@gkss.de, neu@sanw.unibe.ch, vramanathan@ucsd.edu, vr@gfdl.noaa.gov, wmunk@ucsd.edu, peltier@atmosph.physics.utoronto.ca, peter@ldeo.columbia.edu, dkaroly@ou.edu, santer1@llnl.gov, robock@envsci.rutgers.edu, rsomerville@ucsd.edu, HCullen@weather.com, david.parker@metoffice.com, harvey@circque.geog.utoronto.ca, rbierbau@umich.edu, keith.alverson@pages.unibe.ch, mark.eakin@noaa.gov, jtkon@ncar.ucar.edu, jmahlman@ucar.edu, tbarnett@ucsd.edu, rwatson@worldbank.org, chairipcc@teri.res.in, sasha@ucsd.edu, natasha@atmos.uiuc.edu, schlesin@atmos.uiuc.edu, masson@lsce.saclay.cea.fr, mehta@climate.gsfc.nasa.gov, Donald.L.Anderson@maine.gov, knutti@climate.unibe.ch, stocker@climate.unibe.ch, weaver@ocean.seos.uvic.ca, ottobli@ucar.edu, tcrowley@duke.edu, gmbean@julian.uwo.ca, henry.hengeveld@ec.gc.ca, elizabeth.bush@ec.gc.ca, francis.zwiers@ec.gc.ca, Douglas.whelpdale@ec.gc.ca, john.stone@ec.gc.ca, christopher.d.miller@noaa.gov, dverardo@nsf.gov, j.salinger@niwa.co.nz, Barrie.Pittock@csiro.au, m.hulme@uea.ac.uk, n.nicholls@bom.gov.au, mann@virginia.edu

Dear Colleagues,

Tim Osborn, Keith Briffa, and Phil Jones of the University of East Anglia have posted a commentary on the recent paper by McIntyre and McKittrick (Energy and Environment, 14, 751-771, 2003) which claimed to provide an "audit" of the analysis of Mann, Bradley and Hughes (Nature, 392, 779-787, 1998; hereafter MBH98), with a link to our response to the paper here:

<http://www.cru.uea.ac.uk/~timo/paleo/>

I imagine that the additional information provided will place a very different perspective on the matter.

Please feel free to forward this information to anyone who you feel might benefit from it.

Best regards,

Mike Mann

---

Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

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e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: FYI

From: "Michael E. Mann" <mann@virginia.edu>

Date: 11/4/03 7:53 AM

To: rbradley@geo.umass.edu, mhughes@ltr.arizona.edu, Tim Osborn <t.osborn@uea.ac.uk>, "Keith Briffa" <k.briffa@uea.ac.uk>, "phil Jones" <p.jones@uea.ac.uk>, mann@virginia.edu

<http://www.davidappell.com/>

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Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

---

e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: Eos reply/response out

From: "Michael E. Mann" <mann@virginia.edu>

Date: 11/5/03 5:14 AM

To: Caspar Ammann <ammann@ucar.edu>, rbradley@geo.umass.edu, "Keith Briffa" <k.briffa@uea.ac.uk>, tom crowley <tom@ocean.tamu.edu>, mhughes@ltrr.arizona.edu, Phil Jones <p.jones@uea.ac.uk>, Jonathan Overpeck <jto@u.arizona.edu>, Tim Osborn <t.osborn@uea.ac.uk>, Michael Oppenheimer <omichael@Princeton.EDU>, Scott Rutherford <srutherford@rwu.edu>, Kevin Trenberth <trenbert@cgd.ucar.edu>, Tom Wigley <wigley@meeker.UCAR.EDU>

<http://www.agu.org/pubs/eos/>

---

Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

---

e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Attachments:

EosReply03.pdf 46.1 KB

Subject: Cook et al abstract  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 11/11/03 6:25 PM  
To: "Malcolm Hughes" <mhughes@ltr.arizona.edu>

HI Malcolm,

I can't remember where this appeared--I think it was a conference in Norway or Sweden or something, last summer...

mike

---

Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

---

e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Attachments:

CookDArrigoEsper-workshop03.pdf 2.1 MB

Subject: Re: MBH98  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 11/11/03 10:36 PM  
To: "Steve McIntyre" <smcintyre@cgxenergy.com>  
CC: "Tim Osborn" <t.osborn@uea.ac.uk>, "Ross McKittrick" <rmckitri@uoguelph.ca>

Dear Mr. McIntyre,

There seems to be some confusion on your part regarding the public posting of the MBH98 data.

All of the data used by MBH98 have been available in plain ASCII format on this public ftp site

<ftp://holocene.evsc.virginia.edu/pub/MBH98/>

They have been available in the various clearly indicated sub-directories, back through at least summer 2002 according to the dates on those directories. This includes all 159 predictors used by MBH98 back to AD 1400 \*and\* all of the proxy data that go into those indicators.

When I sent you the below email message on 4/9/2003, it was my expectation that you would go to that ftp site to get the individual data series in question. I was not party to the various emails you and Scott Rutherford exchanged regarding alternative versions of the dataset that he prepared, though I am told he offered you all of the proxy data, and you instead preferred a dataset of 112 proxy indicators (that is the number of indicators available back to 1820).

With regard to the latest changes made by Scott on the ftp site, I believe this was to replace the incorrect spreadsheet version of the data that had been posted previously with a corrected version, so that people do not continue to download an incorrect version of the data set.

To reiterate once last time, the original data that you requested before and now request again are all on the indicated ftp site, in the indicated directories, and have been there since at least 2002. I therefore trust you should have no problem acquiring the data you now seek.

Mike Mann

>Dear Mr. McIntyre,

>

>These data are available on an anonymous ftp site we have set up. I've forgotten the exact >location, but I've asked my Colleague Dr. Scott Rutherford if he can provide you with that >information.

>

>best regards,

>

>Mike Mann

At 01:47 PM 4/8/2003 -0400, Steve McIntyre wrote:

Dear Dr. Mann,

I have been studying MBH98 and 99. I located datasets for the 13 series used in 99 at <ftp://eclogite.geo.umass.edu/pub/mann/ONLINE-PREPRINTS/Millennium/DATA/PROXIES/> (the convenience of the ftp: location being excellent) and was interested in locating similar information on the 112 proxies referred to in MBH98, as well as listing (the listing at [http://www.ngdc.noaa.gov/paleo/ei/data\\_supp.html](http://www.ngdc.noaa.gov/paleo/ei/data_supp.html) is for 390 datasets, and I gather/presume that many of these listed datasets have been condensed into PCs, as mentioned in the paper itself. Thank you for your attention.

Yours truly,

Stephen McIntyre,  
Toronto, Canada

At 11:39 PM 11/11/2003 -0500, Steve McIntyre wrote:

> <?xml:namespace prefix = o ns = "urn:schemas-microsoft-com:office:office" />

>

> November 11, 2003

>

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>

> Professor Michael E. Mann

>

> School of Earth Sciences

>

> University of Virginia

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> Dear Professor Mann,

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> We apologize for not sending you a copy of our recent paper (â€œMMâ€) in Energy and Environment for comment, as we understood from your email of September 25, 2003 that time constraints prevented you from considering our material. We notice that you seem to have subsequently changed your mind and hope that you will both be able to clarify some points for us and to rectify the public record on other points.

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>

>

> 1) You have claimed that we used the wrong data and the wrong computational methodology. We would like to reconcile our results to actual data and methodology used in MBH98. We would therefore appreciate copies of the computer programs you actually used to read in data (the 159 data series referred to in your recent comments) and construct the temperature index shown in Nature (1998) (â€œMBH98â€), either through email or, preferably through public FTP or web posting.

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>

> 2) In some recent comments, you are reported as stating that we requested an Excel file and that you instead directed us to an FTP site for the MBH98 data. You are also reported as saying that despite having pointed us to the FTP site, you and your colleague took trouble to prepare an Excel spreadsheet, but inadvertently introduced some collation errors at that time. In fact, as you no doubt recall, we did not request an Excel spreadsheet, but specifically asked for an FTP location, which you were unable or unwilling to provide. Nor was an Excel spreadsheet ever supplied to us; instead we were given a text file, pcproxy.txt. Nor was this file created in April 2003. After we learned on October 29, 2003 that the pertinent data was reported to be located on your FTP site ftp://holocene.evsc.virginia.edu/pub (and that we were being faulted for not getting it from there), we examined this site and found it contains the exact same file (pcproxy.txt) as the one we received, bearing a date of creation of August 8, 2002. On October 29, 2003, your FTP site also contained the file pcproxy.mat, a Matlab file, the header to which read: â€œMATLAB 5.0 MAT-file, Platform: SOL2, Created on: Thu Aug 8 10:18:19 2002.â€ Both files contain identical data to the file pcproxy.txt emailed to one

of us (McIntyre) in April 2003, including all collation errors, fills and other problems identified in MM. It is therefore clear that the file pproxy.txt as sent to us was not prepared in April 2003 in response to our requests, nor was it prepared as an Excel spreadsheet, but in fact it was prepared many months earlier with Matlab. It is also clear that, had we gone to your FTP site earlier, we would simply have found the same data collation as we received from Scott Rutherford. Would you please forthwith issue a statement withdrawing and correcting your earlier comments.

>

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>

> 3) In reported comments, you also claimed that we overlooked the collation errors in pproxy.txt and "ceslid" the incorrect data into our calculations, a statement which is untrue and made without a reasonable basis. In MM, we described numerous errors including, but not limited to, the collation errors, indicating quite obviously that we noticed the data problems. We then describe how we "efirewalled" our data from the errors contained in the data you provided us, by re-collating tree ring proxy data from original sources and carrying out fresh principal component calculations. We request that you forthwith withdraw the claim that we deliberately used data we knew to be in error.

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>

> 4) On November 8, 2003, when we re-visited your FTP site, we noticed the following changes since October 29, 2003: (1) the file pproxy.mat had been deleted from your FTP site; (2) the file pproxy.txt no longer was displayed under the /sdr directory, where it had previously been located, although it could still be retrieved through an exact call if one previously knew the exact file name; (3) without any notice, a new file named "cmbhfilled.mat" prepared on November 4, 2003 had been inserted into the directory. Obviously, the files pproxy.mat and pproxy.txt are pertinent to the comments referred to above and we view the deletion of pproxy.mat from the archival record under the current circumstances as unjustifiable. Would you please restore these files to your FTP site, together with an annotated text file documenting the dates of their deletion and restoration.

>

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>

> 5) We note that the new file mbhfilled.mat is an array of dimension 381x2016. Could you state whether this file has any connection to MBH98, and, if so, please explain the purpose of this file, why it has been posted now and why it was not previously available at the FTP site.

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> 6) Can you advise us whether the directory MBH98 has been a subdirectory within the folder "epub" since July 30, 2002 or whether it was transferred from another (possibly private) directory at a date after July 30, 2002? If the latter, could you advise on the date of such transfer.

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> We have prepared a 3-part response to your reply to MM. The first, which we have released publicly, goes over some of the matters raised in points #2-#5 above. The second is undergoing review. It deals with additional issues of data quality and disclosure, resulting from inspection of your FTP site since October 29, 2003. The third part will consider the points made in your response, both in terms of data and methodology, and will attempt a careful reconciliation of our calculation methods, hence the necessity of our request in point #1. Thank you for your attention.

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>

> Yours truly,

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>  
> Stephen McIntyre                      Ross McKitrick  
>  
>  
>  
>  
> cc: Timothy Osborn

---

Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

---

e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: public ftp site  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 11/12/03 8:25 AM  
To: gnishimura@usatoday.com  
CC: mann@virginia.edu

Dear Glen,

Once again, I appreciate USA Today taking the efforts to correct the misstatement that was made in the USA Today op-ed last week regarding the public availability of our data.

The raw data have been available at this public ftp site:

<ftp://holocene.evsc.virginia.edu/pub/MBH98/>

since July 30, 2002 according to the dates on the directories. This pre-dates by about 9 months the request for data by the authors of the Energy and Environment paper.

Thanks again for your attention to the matter. I would appreciate any advance notice you might be able to provide on when the correction is set to appear.

Best regards,

Mike Mann

---

Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

---

e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: Re: MBH98  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 11/13/03 6:02 AM  
To: "Steve McIntyre" <smcintyre@cgxenergy.com>  
CC: "Ross McKittrick" <rmckitri@uoguelph.ca>, <t.osborn@uea.ac.uk>, bph@virginia.edu

Mr. McIntyre,

All of the data used by Mann et al (1998), including the specific 159 series that are used in the stepwise reconstruction approach clearly described in our original article, are available on our public ftp site:

<ftp://holocene.evsc.virginia.edu/pub/MBH98/>

in a clearly organized directory structure, where they have been since the summer of 2002, nine months prior to any request on your part for the data. This is a hard fact that you seem unwilling to accept. The "BACKTO\_XXX" directories within each sub-directory contain the specific networks of data (including PCs of the various sub networks) used back to each starting point of the various intervals of the stepwise reconstruction. The directories also include all the individual proxy data that were used to construct the PC series for each sub-interval. It is unfortunate that you continue to seek to advance the view that all of these data are not in the public domain, when other scientists, indeed, have successfully downloaded the data from our ftp site. You'll note in my original email to you that I steered you towards our ftp site, not towards a spreadsheet version of the data, which was provided to you in response to a specific request on your part to Scott Rutherford (the earlier matlab date on that text file, which you have noted in your attempts to misrepresent the history behind this, results from the fact that he produced that file for you from a master matlab file that he had used for his own purposes at an earlier time).

The file that you requested from him includes 112 indicators that comprise the network used by Mann et al for the 1820-1980 component, it does not contain the full set of 159 indicators. You did not indicate to Scott Rutherford your purposes at the time, so he had to anticipate precisely what you were asking for.

The new file posted on our website, according to Scott Rutherford, is unrelated to this entire matter--it is an unrelated dataset that has been posted for use by colleagues of ours at another institution. I am suggesting to Scott, by cc of this email, that it be put in a separate location to avoid any future confusion. By cc of this message to Scott, I am also suggesting that any spreadsheet versions of our data should be deleted from our website, as they seem only to have added to confusion. That you have sought to publicly vilify Scott Rutherford (and me) for a good faith effort on his part to provide you data in a format you had requested is unconscionable.

I am far too busy to be answering the same question over and over for you again, so this will be our final email exchange. That you have oddly cc'd your message to the chair of our department, by the way, unfairly places him in an awkward position, and you may want to apologize to him for that.

I am sorry that you did not, as originally suggested to you by me on 4/9/03 (see below), simply go to our ftp site where all of the data were available, and that you continue to cast aspersions against others for what can only be viewed as some serious mistakes made on your own part.

Sincerely,

Mike Mann

>Dear Mr. McIntyre,

>

>There seems to be some confusion on your part regarding the public posting of the MBH98 data.

>

>All of the data used by MBH98 have been available in plain ASCII format on this public ftp site

>  
>ftp://holocene.evsc.virginia.edu/pub/MBH98/  
>  
>They have been available in the various clearly indicated sub-directories, back through at least summer 2002  
>according to the dates on those directories. This includes all 159 predictors used by MBH98 back to AD 1400 >\*and\*  
>all of the proxy data that go into those indicators.  
>  
>When I sent you the below email message on 4/9/2003, it was my expectation that you would go to that ftp site >to  
>get the individual data series in question. I was not party to the various emails you and Scott Rutherford >exchanged  
>regarding alternative versions of the dataset that he prepared, though I am told he offered you all of >the proxy data,  
>and you instead preferred a dataset of 112 proxy indicators (that is the number of indicators >available back to 1820).  
>  
>With regard to the latest changes made by Scott on the ftp site, I believe this was to replace the incorrect  
>spreadsheet version of the data that had been posted previously with a corrected version, so that people do not  
>continue to download an incorrect version of the data set.  
>  
>To reiterate once last time, the original data that you requested before and now request again are all on the >indicated  
>ftp site, in the indicated directories, and have been there since at least 2002. I therefore trust you >should have no  
>problem acquiring the data you now seek.

>Mike Mann

>>

>>

>>Dear Mr. McIntyre,

>>

>>These data are available on an anonymous ftp site we have set up. I've forgotten the exact  
>>location, but I've asked my Colleague Dr. Scott Rutherford if he can provide you with that nformation.

>>

>>best regards,

>>

>>Mike Mann

At 11:30 PM 11/12/2003 -0500, Steve McIntyre wrote:

> <?xml:namespace prefix = o ns = "urn:schemas-microsoft-com:office:office" />

>

> Dear Prof. Mann,

>

> You say that, after the publication of our paper, Scott Rutherford deleted the files pproxy.txt and pproxy.mat from  
>your FTP site so that people "do not continue to download an incorrect version of the dataset". Having acknowledged  
>that you posted up an "incorrect version" for people to download, surely you are obliged to provide notice of this  
>revision at your webpage and FTP site, so that other users of your data archive who have downloaded the incorrect  
>data are apprised of the problem. Also you have not indicated where the "corrected" version is. I have been unable to  
>locate this "corrected" version and presumably other users will be in the same position. Could you please provide me  
>with an exact reference for the "corrected" version. There are many more series on the MBH98 directory than the 159  
>series reportedly used in MBH98 and, in the absence of a roster, there is no way to pick them out.

>

> We are making a concerted effort to reconcile our results with your results and to avoid debate which is merely at  
>cross purposes. To accomplish this, as requested yesterday, we would appreciate a copy of the computer programs  
>actually used to read in the 159 series and to carry out the temperature reconstruction in MBH98.

>

> I note that you did not reply to many of our concerns, but am focussing here on matters which can easily be resolved  
>merely by releasing some text files.

>

> Thank you for your consideration, Steve McIntyre

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>  
> ----- Original Message -----  
> From: Michael E. Mann  
> To: Steve McIntyre  
> Cc: Tim Osborn ; Ross McKittrick  
> Sent: Wednesday, November 12, 2003 12:36 AM  
> Subject: Re: MBH98

> Dear Mr. McIntyre,

> There seems to be some confusion on your part regarding the public posting of the MBH98 data.

> All of the data used by MBH98 have been available in plain ASCII format on this public ftp site

> ftp://holocene.evsc.virginia.edu/pub/MBH98/

> They have been available in the various clearly indicated sub-directories, back through at least summer 2002 according to the dates on those directories. This includes all 159 predictors used by MBH98 back to AD 1400 \*and\* all of the proxy data that go into those indicators.

> When I sent you the below email message on 4/9/2003, it was my expectation that you would go to that ftp site to get the individual data series in question. I was not party to the various emails you and Scott Rutherford exchanged regarding alternative versions of the dataset that he prepared, though I am told he offered you all of the proxy data, and you instead preferred a dataset of 112 proxy indicators (that is the number of indicators available back to 1820).

> With regard to the latest changes made by Scott on the ftp site, I believe this was to replace the incorrect spreadsheet version of the data that had been posted previously with a corrected version, so that people do not continue to download an incorrect version of the data set.

> To reiterate once last time, the original data that you requested before and now request again are all on the indicated ftp site, in the indicated directories, and have been there since at least 2002. I therefore trust you should have no problem acquiring the data you now seek.

> Mike Mann

> >Dear Mr. McIntyre,

> >These data are available on an anonymous ftp site we have set up. I've forgotten the exact >location, but I've asked my Colleague Dr. Scott Rutherford if he can provide you with that >information.

> >best regards,

> >Mike Mann

> At 01:47 PM 4/8/2003 -0400, Steve McIntyre wrote:

> Dear Dr. Mann,

> I have been studying MBH98 and 99. I located datasets for the 13 series used in 99 at ftp://eclogite.geo.umass.edu/pub/mann/ONLINE-PREPRINTS/Millennium/DATA/PROXIES/ (the convenience of the ftp: location being excellent) and was intereseted in locating similar information on the 112 proxies referred to in MBH98, as well as listing (the listing at http://www.ngdc.noaa.gov/paleo/ei/data\_supp.html is for 390 datasets, and I gather/presume that many of these listed datasets have been condensed into PCs, as mentioned in the paper itself.

Thank you for your attention.

>

> Yours truly,

>

> Stephen McIntyre,

> Toronto, Canada

>

> At 11:39 PM 11/11/2003 -0500, Steve McIntyre wrote:

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>> <?xml:namespace prefix = o ns = "urn:schemas-microsoft-com:office:office" />

>>

>> November 11, 2003

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>> Professor Michael E. Mann

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>> School of Earth Sciences

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>> University of Virginia

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We apologize for not sending you a copy of our recent paper (â€œMMâ€) in Energy and Environment for comment, as we understood from your email of September 25, 2003 that time constraints prevented you from considering our material. We notice that you seem to have subsequently changed your mind and hope that you will both be able to clarify some points for us and to rectify the public record on other points.

Dear Professor Mann,

1) You have claimed that we used the wrong data and the wrong computational methodology. We would like to reconcile our results to actual data and methodology used in MBH98. We would therefore appreciate copies of the computer programs you actually used to read in data (the 159 data series referred to in your recent comments) and construct the temperature index shown in Nature (1998) (â€œMBH98â€), either through email or, preferably through public FTP or web posting.

2) In some recent comments, you are reported as stating that we requested an Excel file and that you instead directed us to an FTP site for the MBH98 data. You are also reported as saying that despite having pointed us to the FTP site, you and your colleague took trouble to prepare an Excel spreadsheet, but inadvertently introduced some collation errors at that time. In fact, as you no doubt recall, we did not request an Excel spreadsheet, but specifically asked for an FTP location, which you were unable or unwilling to provide. Nor was an Excel spreadsheet ever supplied to us; instead we were given a text file, pcproxy.txt. Nor was this file created in April 2003. After we learned on October 29, 2003 that the pertinent data was reported to be located on your FTP site ftp://holocene.evsc.virginia.edu/pub (and that we were being faulted for not getting it from there), we examined this

site and found it contains the exact same file (pcproxy.txt) as the one we received, bearing a date of creation of August 8, 2002. On October 29, 2003, your FTP site also contained the file pcproxy.mat, a Matlab file, the header to which read: "MATLAB 5.0 MAT-file, Platform: SOL2, Created on: Thu Aug 8 10:18:19 2002." Both files contain identical data to the file pcproxy.txt emailed to one of us (McIntyre) in April 2003, including all collation errors, fills and other problems identified in MM. It is therefore clear that the file pcproxy.txt as sent to us was not prepared in April 2003 in response to our requests, nor was it prepared as an Excel spreadsheet, but in fact it was prepared many months earlier with Matlab. It is also clear that, had we gone to your FTP site earlier, we would simply have found the same data collation as we received from Scott Rutherford. Would you please forthwith issue a statement withdrawing and correcting your earlier comments.

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>> 3) In reported comments, you also claimed that we overlooked the collation errors in pcproxy.txt and "slid" the incorrect data into our calculations, a statement which is untrue and made without a reasonable basis. In MM, we described numerous errors including, but not limited to, the collation errors, indicating quite obviously that we noticed the data problems. We then describe how we "firewalled" our data from the errors contained in the data you provided us, by re-collating tree ring proxy data from original sources and carrying out fresh principal component calculations. We request that you forthwith withdraw the claim that we deliberately used data we knew to be in error.

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>> 4) On November 8, 2003, when we re-visited your FTP site, we noticed the following changes since October 29, 2003: (1) the file pcproxy.mat had been deleted from your FTP site; (2) the file pcproxy.txt no longer was displayed under the /sdr directory, where it had previously been located, although it could still be retrieved through an exact call if one previously knew the exact file name; (3) without any notice, a new file named "mbhfilled.mat" prepared on November 4, 2003 had been inserted into the directory. Obviously, the files pcproxy.mat and pcproxy.txt are pertinent to the comments referred to above and we view the deletion of pcproxy.mat from the archival record under the current circumstances as unjustifiable. Would you please restore these files to your FTP site, together with an annotated text file documenting the dates of their deletion and restoration.

>>  
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>> 5) We note that the new file mbhfilled.mat is an array of dimension 381x2016. Could you state whether this file has any connection to MBH98, and, if so, please explain the purpose of this file, why it has been posted now and why it was not previously available at the FTP site.

>>  
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>> 6) Can you advise us whether the directory MBH98 has been a subdirectory within the folder "pub" since July 30, 2002 or whether it was transferred from another (possibly private) directory at a date after July 30, 2002? If the latter, could you advise on the date of such transfer.

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>> We have prepared a 3-part response to your reply to MM. The first, which we have released publicly, goes over some of the matters raised in points #2-#5 above. The second is undergoing review. It deals with additional issues of data quality and disclosure, resulting from inspection of your FTP site since October 29, 2003. The third part will consider the points made in your response, both in terms of data and methodology, and will attempt a careful reconciliation of our calculation methods, hence the necessity of our request in point #1. Thank you for your attention.

>>  
>>  
>>



Subject: Accusation Retracted in Yesterday's "USA Today"

From: "Michael E. Mann" <mann@virginia.edu>

Date: 11/14/03 10:10 AM

To: mhughes@ltrr.arizona.edu, rbradley@geo.umass.edu, Tom Wigley <wigley@cgd.ucar.edu>, Jonathan Overpeck <jto@u.arizona.edu>, Michael Oppenheimer <omichael@Princeton.EDU>, Scott Rutherford <srutherford@rwu.edu>, Tim Osborn <t.osborn@uea.ac.uk>, Phil Jones <p.jones@uea.ac.uk>, Keith Briffa <k.briffa@uea.ac.uk>

FYI,

USA Today ran a retraction of one of the claims made against us in the op-ed they published last week, in yesterday's paper. The retraction could have been stronger, but this is a step in the right direction. See below and the attached pdf file (print version)..

Mike

> (c) USA TODAY - THURSDAY - November 13, 2003 - 14A

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> Corrections & Clarifications

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> In an Oct. 29 Forum article about new research that challenges the findings of an earlier study on global warming, the writer said the data on the original study by University of Virginia assistant professor Michael Mann aren't available online. The data can be accessed at <ftp://holocene.evsc.virginia.edu/pub/MBH98/>.

> .

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Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

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e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Attachments:

USATodayRetraction13Nov03.pdf 113 KB

Subject: interesting blog

From: "Michael E. Mann" <mann@virginia.edu>

Date: 11/14/03 12:33 PM

To: rbradley@geo.umass.edu, mhughes@ltr.arizona.edu, Scott Rutherford <srutherford@rwu.edu>, Tom Wigley <wigley@cgd.ucar.edu>, Michael Oppenheimer <omichael@Princeton.EDU>, Steve Schneider <shs@stanford.edu>, Stefan Rahmstorf <rahmstorf@pik-potsdam.de>, Keith Briffa <k.briffa@uea.ac.uk>, Phil Jones <p.jones@uea.ac.uk>, Tim Osborn <t.osborn@uea.ac.uk>

Dear Colleagues,

Freelance journalist David Appell has an interesting blog today on his website, "M&M: How It Looks from Here"...

mike

---

Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

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e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: a slightly more balanced view from USA Today...

From: "Michael E. Mann" <mann@virginia.edu>

Date: 11/18/03 8:50 PM

To: rbradley@geo.umass.edu, mhughes@lrr.arizona.edu, Scott Rutherford <srutherford@rwu.edu>, Michael Oppenheimer <omichael@Princeton.EDU>, Phil Jones <p.jones@uea.ac.uk>, Tim Osborn <t.osborn@uea.ac.uk>, Keith Briffa <k.briffa@uea.ac.uk>, Tom Wigley <wigley@cgd.ucar.edu>, Stefan Rahmstorf <rahmstorf@pik-potsdam.de>, shs@stanford.edu, tom crowley <tom@ocean.tamu.edu>, Gabi Hegerl <hegerl@duke.edu>, Gavin Schmidt <gavin@isis.giss.nasa.gov>, Mike MacCracken <mmaccrac@comcast.net>, Jonathan Overpeck <jto@u.arizona.edu>

[http://www.usatoday.com/weather/climate/2003-11-18-warming-debate\\_x.htm](http://www.usatoday.com/weather/climate/2003-11-18-warming-debate_x.htm)

---

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Charlottesville, VA 22903

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e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: Re: a slightly more balanced view from USA Today...

From: "Michael E. Mann" <mann@virginia.edu>

Date: 11/19/03 5:43 AM

To: Stefan Rahmstorf <rahmstorf@pik-potsdam.de>

CC: rbradley@geo.umass.edu, mhughes@ltrr.arizona.edu, Scott Rutherford <srutherford@rwu.edu>, Michael Oppenheimer <omichael@Princeton.EDU>, Phil Jones <p.jones@uea.ac.uk>, Tim Osborn <t.osborn@uea.ac.uk>, Keith Briffa <k.briffa@uea.ac.uk>, Tom Wigley <wigley@cgd.ucar.edu>, shs@stanford.edu, tom crowley <tom@ocean.tamu.edu>, Gabi Hegerl <hegerl@duke.edu>, Gavin Schmidt <gavin@isis.giss.nasa.gov>, Mike MacCracken <mmaccrac@comcast.net>, Jonathan Overpeck <jto@u.arizona.edu>

Thanks Stefan,

Sorry, I was being glib in my message -yes, II think the article is excellent. It should go a long way to clearing up the disinformation,

mike

At 12:11 PM 11/19/2003 +0100, Stefan Rahmstorf wrote:

> Dear Mike,

>

> I think that article is not only slightly more balanced, it actually is quite good.

>

> Stefan

>

> --

> Stefan Rahmstorf

> Potsdam Institute for Climate Impact Research (PIK)

> For contact details, reprints, movies & general infos see:

> <http://www.pik-potsdam.de/~stefan>

>

>

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<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: away from my mail  
From: "Michael E. Mann" <mem6u@multiproxy.evsc.Virginia.EDU>  
Date: 11/25/03 4:11 PM  
To: mhughes@ltrr.arizona.edu

I will away from my email through Monday, December 1.

Your message concerning "Re: revised version w/ figure 1 fixed attached..."  
will be read when I return.

Subject: NSF

From: "raymond s. bradley" <rbradley@geo.umass.edu>

Date: 12/17/03 1:51 PM

To: mann@multiproxy.evsc.virginia.edu, mhughes@ltrr.arizona.edu

My God--DV did something right. MUST BE THE SEASON FOR MIRACLES!

Subject: Fwd: extended abstract, registration form, and problem with hotel reservation  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 1/19/04 5:11 PM  
To: Dendro\_meeting@ltrr.arizona.edu  
CC: "Malcolm Hughes" <mhughes@ltrr.arizona.edu>

Dear Malcolm/workshop organizers.

A friendly reminder. The hotel still tells me that my name is not on their list, and therefore I cannot reserve my hotel room at the conference rate.

Please let me know when this has been fixed, so I can go ahead and finalize my plans.

Thanks in advance,

Mike M

> Date: Thu, 08 Jan 2004 16:28:42 -0500  
> To: Dendro\_meeting@ltrr.arizona.edu  
> From: "Michael E. Mann" <mann@virginia.edu>  
> Subject: extended abstract, registration form, and problem with hotel reservation  
>  
> Dear Malcolm/workshop organizers  
>  
> Attached are my extended abstract and registration form for the April workshop.  
>  
> Unfortunately, I was unable to book my reservation at the Marriott University Park Hotel because I was told by them that they have not yet received the conference information (the list of names of individuals associated with the conference) necessary to book people at the conference rate.  
>  
> I would appreciate knowing when this has been rectified, so that I can go ahead and reserve my hotel room.  
>  
> Thanks in advance,  
>  
> Mike Mann  
>  
>  
> \_\_\_\_\_  
> Professor Michael E. Mann  
> Department of Environmental Sciences, Clark Hall  
> University of Virginia  
> Charlottesville, VA 22903  
>  
> \_\_\_\_\_  
> e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137  
> <http://www.evsc.virginia.edu/faculty/people/mann.shtml>

\_\_\_\_\_  
Professor Michael E. Mann  
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Charlottesville, VA 22903

\_\_\_\_\_  
e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: Re: Fwd: extended abstract, registration form, and problem with hotel reservation  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 1/19/04 8:16 PM  
To: mhughes@ltrr.arizona.edu

ok...thanks a bunch Malcolm,

mike

At 08:03 PM 1/19/2004 -0700, you wrote:

> Thanks Mike. I forwarded your message to the admin person, but she was out  
> Friday, and today is a holiday. I hope to get it fixed tomorrow and will let  
> you know. Cheers, Malcolm  
> Quoting "Michael E. Mann" <mann@virginia.edu>:

>  
>>  
>>  
>> Dear Malcolm/workshop organizers.

>>  
>> A friendly reminder. The hotel still tells me that my name is not on  
>> their list, and therefore I cannot reserve my hotel room at the  
>> conference rate.

>>  
>> Please let me know when this has been fixed, so I can go ahead and  
>> finalize my plans.

>>  
>> Thanks in advance,

>>  
>> Mike M

>>  
>> Date: Thu, 08 Jan 2004 16:28:42  
>> -0500

>>  
>> To: Dendro\_meeting@ltrr.arizona.edu

>>  
>> From: "Michael E. Mann" <mann@virginia.edu>

>>  
>> Subject: extended abstract, registration form, and problem with hotel  
>> reservation

>>  
>> Dear Malcolm/workshop organizers

>>  
>> Attached are my extended abstract and registration form for the April  
>> workshop.

>>  
>>

>> Unfortunately, I was unable to book my reservation at the Marriott  
>> University Park Hotel because I was told by them that they have not yet  
>> received the conference information (the list of names of individuals  
>> associated with the conference) necessary to book people at the  
>> conference rate.

>> I would appreciate knowing when this has been rectified, so that I can go  
>> ahead and reserve my hotel room.

>> Thanks in advance,

>> Mike Mann

---

>> Professor Michael E. Mann

>> Department  
>> of Environmental Sciences, Clark Hall

>> University of Virginia

>> Charlottesville, VA 22903

---

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> > <http://www.evsc.virginia.edu/faculty/people/mann.shtml>

> >

> >

> >

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<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: away from my mail  
From: "Michael E. Mann" <mem6u@multiproxy.evsc.Virginia.EDU>  
Date: 1/29/04 9:34 AM  
To: mhughes@ltrr.arizona.edu

I will be travelling and not reading email through Monday, February 2.

Your message concerning "Re: picky fixes in the Supp. Docs"  
will be read when I return.

Subject: GRL in press  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 3/16/04 2:04 PM  
To: mhughes@ltrr.arizona.edu

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Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

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e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Attachments:  
grlmann04final.pdf 393 KB

Subject: Malcolm Hughes visit schedule  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 3/16/04 1:11 PM  
To: cba4a@virginia.edu  
CC: mhughes@lrr.arizona.edu, mann@virginia.edu

Dear Cindy,

Here is Malcolm Hughes visit schedule for Wednesday->Thursday.

mike

---

Wed

10:30-11:00 AM Ben Cook  
11:00-11:30 AM Steve Macko  
12:00 Lunch  
1:30-2:00 PM David Richardson  
4:30-5:00 PM Jose Fuentes

Thurs

12:00-1:00 PM Lunch w/ grad students (Ben Cook organizer)  
1:00-1:30 PM Meet w/ Zhang Zhihua  
3:30 PM Prepare for Seminar  
4:00-5:00 Seminar  
  
7:00 PM Dinner w/Mann, Shugard, Ruddiman, Lawrence

---

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Charlottesville, VA 22903

---

e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: Re: Hughes document faxed to IM-REC  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 3/17/04 7:17 AM  
To: "Cynthia B. Allen" <cba4a@cms.mail.virginia.edu>

Thanks bunch Cindy!

mike

At 09:17 AM 3/17/2004 -0500, Cynthia B. Allen wrote:

> Mike:  
>  
> I just faxed the signed letter to Mark Fletcher, director of Intramural -Rec Sports requesting permission for Mr. Hughes to use the Aquatic center.  
>  
> Cindy  
>  
> Cynthia B. Allen  
> Administrative Assistant  
> Department of Environmental Sciences  
> University of Virginia  
> Box 400123  
> Charlottesville VA 22904-4123  
> Tel: 434-924-0561  
> Fax: 434-982-2137

---

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<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: Re: Hughes document faxed to IM-REC  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 3/17/04 7:17 AM  
To: "Cynthia B. Allen" <cba4a@cms.mail.virginia.edu>

Thanks bunch Cindy!

mike

At 09:17 AM 3/17/2004 -0500, Cynthia B. Allen wrote:

> Mike:  
>  
> I just faxed the signed letter to Mark Fletcher, director of Intramural -Rec Sports requesting permission for Mr. Hughes to use the Aquatic center.  
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> Cindy  
>  
> Cynthia B. Allen  
> Administrative Assistant  
> Department of Environmental Sciences  
> University of Virginia  
> Box 400123  
> Charlottesville VA 22904-4123  
> Tel: 434-924-0561  
> Fax: 434-982-2137

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e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: RE: Malcolm's schedule  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 3/17/04 12:15 PM  
To: <hhs@virginia.edu>

Hi Hank,

That should work fine. I'll send Malcolm the update,

mike

At 02:13 PM 3/17/2004 -0500, H.H. Shugart wrote:

> Hi Mike,  
>  
>  
>  
> How about tomorrow (Thursday) from 10:30 till 11:30?

> Thanks,

> Hank

> -----Original Message-----

> From: Michael E. Mann [mailto:mann@virginia.edu]  
> Sent: Tuesday, March 16, 2004 2:29 PM  
> To: hhs@virginia.edu  
> Subject: Malcolm's schedule

> Hi Hank,

> Here's a draft of Malcolm's schedule at present,

> mike

> \_\_\_\_\_  
>  
> Wed  
> 10:30-11:00 AM Ben Cook  
> 11:00-11:30 AM Steve Macko  
> 12:00 Lunch  
> 1:30-2:00 PM David Richardson  
> 4:30-5:00 PM Jose Fuentes

> Thurs

- >
- > 12:00-1:00 PM Lunch w/ grad students (Ben, Zhang, etc)
- > 1:00-1:30 PM Meet w/ Zhang Zhihua
- > 3:30 PM Prepare for Seminar
- > 4:00-5:00 Seminar
- >
- > 7:00 PM Dinner w/Hank S, Bill R., Deb Lawrence

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Professor Michael E. Mann  
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Subject: RE: Malcolm's schedule  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 3/17/04 12:15 PM  
To: <hhs@virginia.edu>

Hi Hank,

That should work fine. I'll send Malcolm the update,

mike

At 02:13 PM 3/17/2004 -0500, H.H. Shugart wrote:

> Hi Mike,

>

>

>

> How about tomorrow (Thursday) from 10:30 till 11:30?

>

>

>

> Thanks,

>

>

>

> Hank

>

>

>

> -----Original Message-----

> From: Michael E. Mann [mailto:mann@virginia.edu]

> Sent: Tuesday, March 16, 2004 2:29 PM

> To: hhs@virginia.edu

> Subject: Malcolm's schedule

>

>

>

> Hi Hank,

>

> Here's a draft of Malcolm's schedule at present,

>

> mike

>

>

>

> Wed

> 10:30-11:00 AM Ben Cook

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> 12:00 Lunch

> 1:30-2:00 PM David Richardson

> 4:30-5:00 PM Jose Fuentes

>

> Thurs

- >
- > 12:00-1:00 PM Lunch w/ grad students (Ben, Zhang, etc)
- > 1:00-1:30 PM Meet w/ Zhang Zhihua
- > 3:30 PM Prepare for Seminar
- > 4:00-5:00 Seminar
- >
- > 7:00 PM Dinner w/Hank S, Bill R., Deb Lawrence

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<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: Cook paper in press  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 3/18/04 9:57 AM  
To: mhughes@ltrr.arizona.edu

---

Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

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e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Attachments:

Cook\_IMAGES.doc 344 KB

Subject: RE: Dr. Mann's Responses to follow-up questions for 7/29/03 climate hearing

From: "Michael E. Mann" <mann@virginia.edu>

Date: 4/14/04 1:49 PM

To: "Miller, Chris (EPW)" <Chris\_Miller@epw.senate.gov>, <wigley@ucar.edu>, "Raymond Bradley" <rbradley@geo.umass.edu>, "Malcolm Hughes" <mhughes@ltr.arizona.edu>, "Phil Jones" <p.jones@uea.ac.uk>, "Kevin Trenberth" <trenbert@ucar.edu>, "Tom Crowley" <tcrowley@duke.edu>, "Scott Rutherford" <srutherford@gso.uri.edu>, "Caspar Ammann" <ammann@ucar.edu>, "Keith Briffa" <k.briffa@uea.ac.uk>, "Tim Osborn" <t.osborn@uea.ac.uk>, "Michael Oppenheimer" <omichael@princeton.edu>, "Steve Schneider" <shs@stanford.edu>, "Gabi Hegerl" <hegerl@duke.edu>, <rahmstorf@pik-potsdam.de>, "Mike MacCracken" <maccrac@comcast.net>, "Ellen Mosley-Thompson" <thompson.4@osu.edu>, "Eric Steig" <steig@ess.washington.edu>, <jmahlman@ucar.edu>, <wuebbles@atmos.uiuc.edu>, "Caspar Ammann" <ammann@ucar.edu>, <jto@u.arizona.edu>

CC: <dreed@environet.org>, "Nikki Roy (E-mail)" <RoyN@pewclimate.org>

Dear Colleagues,

I thought you might be interested in this article, out in the latest issue of GRL (appeared online today).

In case you're wondering, no, I \*don't\* intend to make it a habit of responding to every scurrilous article that finds its way into the peer-reviewed literature. But the Soon et al '04 article begged for a response...

best regards,

Mike M.

At 01:12 PM 4/12/2004 -0400, Miller, Chris (EPW) wrote:

> FYI - I thought you might also be interested in Dr. Mann's responses to  
> EPW Committee followup questions, which were received here more than 4  
> months ago.  
>  
> -----Original Message-----  
> From: Miller, Chris (EPW)  
> Sent: Friday, April 09, 2004 2:19 PM  
> To: mann@virginia.edu; 'wigley@ucar.edu'; Raymond Bradley; Malcolm  
> Hughes; Phil Jones; Kevin Trenberth; Tom Crowley; Scott Rutherford;  
> Caspar Ammann; Keith Briffa; Tim Osborn; Michael Oppenheimer; Steve  
> Schneider; Gabi Hegerl; rahmstorf@pik-potsdam.de; Mike MacCracken; Ellen  
> Mosley-Thompson; Eric Steig; jmahlman@ucar.edu; wuebbles@atmos.uiuc.edu;  
> Caspar Ammann; jto@u.arizona.edu  
> Cc: 'dreed@environet.org'; Nikki Roy (E-mail)  
> Subject: FW: Dr. Soon's and Dr. Legates' Responses to follow-up  
> questions for 7/29/03 climate hearing  
>  
>  
>  
> I thought you might be interested in these. C.  
>  
> Christopher J. Miller  
> Professional Staff Member  
> Senate Committee on Environment and Public Works  
> 456 Dirksen Senate Office Building  
> Washington, D.C. 20510

> 202-224-2969  
> 202-224-1273 - fax  
> chris\_miller@epw.senate.gov <mailto:chris\_miller@epw.senate.gov>

> -----Original Message-----

> From: Matwysheh-Gillen, Suzanne (EPW)  
> Sent: Friday, April 09, 2004 1:39 PM  
> To: Wheeler, Andrew (EPW); Aaron, Stephen (EPW); Dempsey, Matthew (EPW);  
> Dolbeare, Mary Anne (EPW); Ellinger, Carol (EPW); Fannon, Frank (EPW);  
> Fritz, Gerry (EPW); Giancarlo, Angie (EPW); Hall, Marty (EPW); Hart,  
> Will (EPW); Higley, Steve (EPW); Jackson, Ryan (EPW); Leggitt, Debbie  
> (EPW); Lucero, Corinne (EPW); Matwysheh-Gillen, Suzanne (EPW);  
> Nellenbach, Michele (EPW); O'Keefe, James (EPW); Parrish, Lynne (EPW);  
> Richmond, Nathan (EPW); Ryan, Shawn (EPW); Shanahan, John (EPW); Tolman,  
> Jonathan (EPW); VanMark, Ruth (EPW); Woolf, Malcolm (EPW); Baer,  
> Katherine (EPW); Barron, Edward (EPW); Berry, Tom (Jeffords); Boyd,  
> William (EPW); Bresette, Daniel (EPW); Brown, Geoffrey (EPW); Butler,  
> Alicia (EPW); Connolly, Ken (EPW); Contratto, Justin (EPW); Darcy,  
> Jo-Ellen (EPW); Derby, Diane (Jeffords); Dupree, Carolyn (EPW);  
> Heyck-Williams, Shannon (EPW); Johnson, Jeffrey (EPW); Keefe, Brian  
> (Jeffords); McEvoy, Trecia (Jeffords); Miller, Chris (EPW); Munger, Jeff  
> (Jeffords); Nystrom, Duane (EPW); Parker, Wendy (EPW); Phipps, Rae Ann  
> (EPW); Rankin, Patrick (EPW); Ransom, Catharine (EPW); Repko, Mary  
> (EPW); Ryan, Elizabeth (EPW); Samuels, Brenda (EPW); Sandberg, JC (EPW);  
> Smulson, Erik (Jeffords); Somerville, Malia (EPW); Squires, Jeff (EPW);  
> Taylor, Alison (EPW); Wetherald, Margaret (EPW)  
> Cc: Hogan, Aloysius (Inhofe); Nystrom, Duane (EPW)  
> Subject: Dr. Soon's Responses to follow-up questions for 7/29 climate  
> hearing

> Please find attached Dr. Soon's responses to follow-up questions  
> submitted by Senators Inhofe and Jeffords for the 7/29/03  
> Climate/Mercury hearing.

> Thanks, Suzanne

> -----Original Message-----

> From: Willie Soon [mailto:wsoon@cfa.harvard.edu]  
> Sent: Friday, April 09, 2004 12:17 PM  
> To: Matwysheh-Gillen, Suzanne (EPW)  
> Subject: My Reply to Follow-up Questions

> (1) My Reply to Follow-up Questions from Senator Jeffords

> Attached Files:

> (I) JeffordsQnA-Final.doc  
> (II) SLB-GRL04-NHtempTrend.pdf

> (2) My Reply to Follow-up Questions from Senator Inhofe

>

> Attached Files:

> (I) InhofeQnA-Final.doc

> (II) SLB-GRL04-NHtempTrend.pdf

> (III) AlaskaTcomposite.pdf

> (IV) AlaskaT30stations.pdf

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Professor Michael E. Mann

Department of Environmental Sciences, Clark Hall

University of Virginia

Charlottesville, VA 22903

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e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (434) 924-7770 FAX: (434) 982-2137

<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Attachments:

MannGRL04.pdf 661 KB

Subject: away from my mail  
From: "Michael E. Mann" <mem6u@multiproxy.evsc.Virginia.EDU>  
Date: 4/22/04 12:30 PM  
To: mhughes@ltrr.arizona.edu

I will be travelling through May 3.  
Your message concerning "Re: Fwd: report this to Nature?"  
will be read when I return.

Subject: From the Guardian

From: "raymond s. bradley" <rbradley@geo.umass.edu>

Date: 4/27/04 11:13 AM

To: mann@multiproxy.evsc.virginia.edu, mhughes@ltrr.arizona.edu, bradbury@geo.umass.edu, frank@geo.umass.edu, deconto@geo.umass.edu

>> Beware the fossil fools

>> The dismissal of climate change by journalistic nincompoops is a danger to us all

>> George Monbiot

>> Tuesday April 27 2004

>> The Guardian

>>

>>

>> Picture a situation in which most of the media, despite the overwhelming weight of medical opinion, refused to accept that there was a connection between smoking and lung cancer. Imagine that every time new evidence emerged, they asked someone with no medical qualifications to write a piece dismissing the evidence and claiming that there was no consensus on the issue.

>>

>> Imagine that the BBC, in the interests of "debate", wheeled out one of the tiny number of scientists who says that smoking and cancer aren't linked, or that giving up isn't worth the trouble, every time the issue of cancer was raised.

>>

>> Imagine that, as a result, next to nothing was done about the problem, to the delight of the tobacco industry and the detriment of millions of smokers. We would surely describe the newspapers and the BBC as grossly irresponsible.

>>

>> Now stop imagining it, and take a look at what's happening. The issue is not smoking, but climate change. The scientific consensus is just as robust, the misreporting just as widespread, the consequences even graver.

>>

>> If it is true, as the government's new report suggested last week, that it is now too late to prevent hundreds of thousands of British people from being flooded out of their homes, then the journalists who have consistently and deliberately downplayed the threat carry much of the responsibility for the problem. It is time we stopped treating them as bystanders. It is time we started holding them to account.

>> "The scientific community has reached a consensus," the government's chief scientific adviser, Professor David King, told the House of Lords last month. "I do not believe that amongst the scientists there is a discussion as to whether global warming is due to anthropogenic effects.

>>

>> It is man-made and it is essentially [caused by] fossil fuel burning, increased methane production... and so on." Sir David chose his words carefully. There is a discussion about whether global warming is due to anthropogenic (man-made) effects. But it is not - or is only seldom - taking place among scientists. It is taking place in the media, and it seems to consist of a competition to establish the outer reaches of imbecility.

>> During the heatwave last year, the Spectator made the case that because there was widespread concern in the 1970s about the possibility of a new ice age, we can safely dismiss concerns about global warming today.

>>

>> This is rather like saying that because Jean-Baptiste Lamarck's hypothesis on evolution once commanded scientific support and was later shown to be incorrect, then Charles Darwin's must also be wrong.

>>

>> Science differs from the leader writers of the Spectator in that it learns from its mistakes. A hypothesis is advanced and tested. If the evidence suggests it is wrong, it is discarded. If the evidence appears to support it, it is refined and subjected to further testing. That some climatologists predicted an ice age in the 1970s, and that the idea was dropped when others found that their predictions were flawed, is a cause for confidence in climatology.

>> But the Spectator looks like the Journal of Atmospheric Physics compared to the Mail on Sunday and its Nobel laureate-in-waiting, Peter Hitchens. "The greenhouse effect probably doesn't exist," he wrote in 2001. "There is as yet no evidence for it." Perhaps Hitchens would care to explain why our climate differs from that of Mars.

>>

>> That some of the heat from the sun is trapped in the Earth's atmosphere by gases (the greenhouse effect) has been established since the mid-19th century. But, like most of these nincompoops, Hitchens claims to be defending science from its opponents. "The only reason these facts are so little known", he tells us, is (apart from the reason that he has just made them up), "that a self-righteous love of 'the environment' has now replaced religion as the new orthodoxy".

>> Hitchens, in turn, is an Einstein beside that famous climate scientist Melanie Phillips. Writing in the Daily Mail in January, she dismissed the entire canon of climatology as "a global fraud" perpetrated by the "leftwing, anti-American, anti-west ideology which goes hand in hand with anti-globalisation and the belief that everything done by the industrialised world is wicked".

>>

>> This belief must be shared by the Pentagon, whose recent report pictures climate change as the foremost threat to global security. In an earlier article, she claimed that "most independent climate specialists, far from supporting global warming, are deeply sceptical". She managed to name only one, however, and he receives his funding from the fossil fuel industry.

>>

>> Having blasted the world's climatologists for "scientific illiteracy", she then trumpeted her own. The latest report by the Intergovernmental Panel on Climate Change (which collates the findings of climatologists) is, she complained, "studded with weasel words" such as "very likely" and "best estimate". These weasel words are, of course, what make it a scientific report, rather than a column by Melanie Phillips.

>> If ever you meet one of these people, I suggest you ask them the following questions: 1. Does the atmosphere contain carbon dioxide? 2. Does atmospheric carbon dioxide influence global temperatures? 3. Will that influence be enhanced by the addition of more carbon dioxide? 4. Have human activities led to a net emission of carbon dioxide? It would be interesting to discover at which point they answer no - at which point, in other words, they choose to part company with basic physics.

>> But these dolts are rather less dangerous than the BBC, and its insistence on "balancing" its coverage of climate change. It appears to be incapable of running an item on the subject without inviting a sceptic to comment on it.

>>

>> Usually this is either someone from a corporate-funded thinktank (who is, of course, never introduced as such) or the professional anti-environmentalist Philip Stott. Professor Stott is a retired biogeographer. Like almost all the prominent sceptics he has never published a peer-reviewed paper on climate change. But he has made himself available to dismiss climatologists' peer-reviewed work as the "lies" of ecofundamentalists.

>> This wouldn't be so objectionable if the BBC made it clear that these people are not climatologists, and the overwhelming majority of qualified scientific opinion is against them. Instead, it leaves us with the impression that professional opinion is split down the middle. It's a bit like continually bringing people on to the programme to suggest that there is no link between HIV and Aids.

>> What makes all this so dangerous is that it plays into the hands of corporate lobbyists. A recently leaked memo written by Frank Luntz, the US Republican and corporate strategist, warned that "The environment is probably the single issue on which Republicans in general - and President Bush in particular - are most vulnerable... Should the public come to believe that the scientific issues are settled, their views about global warming will change accordingly. Therefore, you need... to make the lack of scientific certainty a primary issue."

>> We can expect Professors Hitchens and Phillips to do what they're told. But isn't it time that the BBC stopped behaving like the public relations arm of the fossil fuel lobby?

>> [www.monbiot.com](http://www.monbiot.com)

>> Copyright Guardian Newspapers Limited

Subject: Fwd: Inhofe to receive science award!  
From: "raymond s. bradley" <rbradley@geo.umass.edu>  
Date: 4/27/04 7:27 AM  
To: mann@multiproxy.evsc.virginia.edu, mhughes@ltrr.arizona.edu, shs@stanford.edu

>  
> <http://www.chriscmooney.com/blog.asp#738>

Raymond S. Bradley  
University Distinguished Professor  
Director, Climate System Research Center\*  
Department of Geosciences, University of Massachusetts  
Morrill Science Center  
611 North Pleasant Street  
AMHERST, MA 01003-9297

Tel: 413-545-2120

Fax: 413-545-1200

\*Climate System Research Center: 413-545-0659

<<http://www.paleoclimate.org>>

Paleoclimatology Book Web Site: <http://www.geo.umass.edu/climate/paleo/html>

Subject: fyi

From: "Michael E. Mann" <mann@virginia.edu>

Date: 5/10/04 9:16 AM

To: jto@u.arizona.edu, rbradley@geo.umass.edu, mhughes@ltrr.arizona.edu, julia Cole <jcole@geo.arizona.edu>, "Tom Crowley" <tcrowley@duke.edu>, wigley@ucar.edu, "Kevin Trenberth" <trenbert@ucar.edu>, "Steve Schneider" <shs@stanford.edu>, Phil Jones <p.jones@uea.ac.uk>, Alan Robock <robock@envsci.rutgers.edu>, Scott Rutherford <srutherford@rwu.edu>, Ellen Mosley-Thompson <thompson.4@osu.edu>, Lonnie Thompson <thompson.3@osu.edu>, Ben Santer <santer1@llnl.gov>, drdendro@ldeo.columbia.edu

Dear Colleagues,

The following article by Phil Jones and myself just appeared in the latest "Reviews of Geophysics":

Jones, P.D., Mann, M.E., Climate Over Past Millennia, Review of Geophysics, 42, RG2002, doi: 10.1029/2003RG000143, 2004.

you can download the pdf file here:

<ftp://holocene.evsc.virginia.edu/pub/mann/JonesMannROG04.pdf>

Please feel free to pass the link on to any other colleagues you think might be interested.

Best regards,

mike

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Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

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e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: thanks  
From: Malcolm Hughes <mhughes@ltrr.arizona.edu>  
Date: 5/10/04 9:46 AM  
To: mann@virginia.edu

Hi Mike - Thanks for the link. Any news at all from Climatic Change or Nature? CHEers, Malcolm

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Subject: away from my mail  
From: "Michael E. Mann" <mem6u@multiproxy.evsc.Virginia.EDU>  
Date: 5/14/04 12:52 PM  
To: mhughes@ltrr.arizona.edu

I will be travelling through May 17.  
Your message concerning "Re: Fwd: NATURE: 2004-01-14277B"  
will be read when I return.

Subject: Re: come around?  
From: Malcolm Hughes <mhughes@ltrr.arizona.edu>  
Date: 5/23/04 8:50 PM  
To: "Michael E. Mann" <mann@virginia.edu>

Mike - couldn't find anything about Ed at that url, Malcolm

On 21 May 2004 at 15:06, Michael E. Mann wrote:

> > Guys,  
> >  
> > It looks like Ed has really come around!  
> >  
> > Check this out (scroll about 2/3 the way down):  
> >  
> > <http://news.google.com/news?hl=en&edition=us&ie=UTF-8&q=Schrag&scoring>  
> > =d  
> >  
> > mike  
> > \_\_\_\_\_  
> > \_\_\_\_\_  
> > Professor Michael E. Mann  
> > Department of Environmental Sciences, Clark Hall  
> > University of Virginia  
> > Charlottesville, VA 22903  
> > \_\_\_\_\_  
> > \_ e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (434) 924-7770 FAX: (434) 982-2137  
> > <http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: CO2 compensation

From: "raymond s. bradley" <rbradley@geo.umass.edu>

Date: 5/28/04 12:57 PM

To: m.kelly@uea.ac.uk, p.jones@uea.ac.uk, mann@multiproxy.evsc.virginia.edu, mhughes@ltrr.arizona.edu, juliebg@geo.umass.edu, deconto@geo.umass.edu, frank@geo.umass.edu, bradbury@geo.umass.edu

You might find this link of interest--whenever you go to a meeting, you pay a fee to compensate for the CO2 you generate in getting there....this is then used to reduce gg emissions in (mainly) the developing world...

<http://www.clipp.org>

I calculate that Phil owes this fund about \$50,000 so far...

ray

Subject: movie time!  
From: "raymond s. bradley" <rbradley@geo.umass.edu>  
Date: 5/29/04 9:13 PM  
To: mann@multiproxy.evsc.virginia.edu, mhughes@ltrr.arizona.edu

The Day after Tomorrow is great--you just have to suspend your knowledge of the laws of physics for a couple of hours...

Funnily enough, the Head of NOAA is Tom...and the paleoclimatologist's trusty assistant is Frank...

The first 15 minutes was especially good and the special effects are truly spectacular. Go see it, but arrive early--the theatre here was packed!

ray

Subject: Re: movie time!  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 5/30/04 5:41 AM  
To: "raymond s. bradley" <rbradley@geo.umass.edu>, mhughes@ltrr.arizona.edu

thanks Ray...we're planning on seeing it later this afternoon,

mike

At 12:13 AM 5/30/2004, raymond s. bradley wrote:

- > The Day after Tomorrow is great--you just have to suspend your knowledge of the laws of physics for a couple of hours...
- > Funnily enough, the Head of NOAA is Tom...and the paleoclimatologist's trusty assistant is Frank...
- > The first 15 minutes was especially good and the special effects are truly spectacular. Go see it, but arrive early--the theatre here was packed!
- > ray
- >

---

Professor Michael E. Mann  
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University of Virginia  
Charlottesville, VA 22903

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e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: check out this new website. Pass it along!

From: "Michael E. Mann" <mann@virginia.edu>

Date: 6/23/04 7:54 PM

To: rbradley@geo.umass.edu, mhughes@ltrr.arizona.edu, "Scott Rutherford" <srutherford@rwu.edu>

<http://www.exxonsecrets.org/>

specifically, you should check this out:

<http://www.exxonsecrets.org/html/personfactsheet.php?id=1007>

<http://www.exxonsecrets.org/html/personfactsheet.php?id=1008>

---

Professor Michael E. Mann

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<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: Re: check out this new website. Pass it along!  
From: "raymond s. bradley" <rbradley@geo.umass.edu>  
Date: 6/23/04 8:44 PM  
To: "Michael E. Mann" <mann@virginia.edu>, mhughes@ltrr.arizona.edu

In a new article published in *Climate Research*, Ross McKittrick of the University of Guelph and Patrick J. Michaels of the University of Virginia have found, through statistical analysis, that the Intergovernmental Panel on Climate Change's temperature data contains a net warming bias due to socioeconomic effects that were not removed properly from the IPCC's records.

In the article, entitled "A test of correlations for extraneous signals in gridded surface temperature data," McKittrick and Michaels obtained monthly surface temperature records from 1979 to 2000 from 218 individual stations in 93 countries. They regressed this temperature data with regards to local climate, as well as indicators of local economic activity (such as income, GDP growth rates, and coal use) and data quality. The authors found that the spatial pattern of trends is shown to be significantly correlated with non-climatic factors such as economic activity and various sociopolitical effects. The process was repeated on the corresponding IPCC gridded data. Despite the IPCC's attempt to remove these non-climatic variables, McKittrick and Michaels found that similar correlations do exist and that the IPCC's data was biased in favor of global warming.

The article explained that, "[The apparent climate biases] reflect the influence of many things, including a complex blend of local economic and social factors. Some of these exert an indirect influence on local temperatures but have nothing to do with the global climate, while others have nothing to do with temperature at all but instead affect data quality control." Controlling for the non-climatic variables would result in a "noticeably lower" temperature change, McKittrick and Michaels observed.

Moreover, "Attempts to identify the magnitude of a global 'greenhouse' climate signal on surface data without properly removing the extraneous biases risks exaggerating the perceived influence of atmospheric CO2 levels."

The article concluded, "The results of this study support the hypothesis that published temperature data are contaminated with non-climatic influences that add up to a net warming bias, and that efforts should be made to properly quantify these effects."

Subject: away from my mail  
From: "Michael E. Mann" <mem6u@multiproxy.evsc.Virginia.EDU>  
Date: 6/25/04 3:40 PM  
To: mhughes@ltrr.arizona.edu

I will be travelling through July 5.  
Your message concerning "Re: revised manuscript"  
will be read when I return.

Subject: more info on "Exxon Secrets"  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 7/8/04 11:28 AM  
To: rbradley@geo.umass.edu, mhughes@ltrr.arizona.edu

[http://www.forestcouncil.org/tims\\_picks/view.php?id=481](http://www.forestcouncil.org/tims_picks/view.php?id=481)

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Professor Michael E. Mann  
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e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: away from my mail  
From: "Michael E. Mann" <mem6u@multiproxy.evsc.Virginia.EDU>  
Date: 7/9/04 3:36 PM  
To: mhughes@ltrr.arizona.edu

I will be travelling through July 16.  
Your message concerning "Re: journalist from Germany"  
will be read when I return.

Subject: all-purpose skeptic for hire?

From: "Michael E. Mann" <mann@virginia.edu>

Date: 7/29/04 2:19 PM

To: rbradley@geo.umass.edu, mhughes@ltrr.arizona.edu, Gavin Schmidt <gschmidt@giss.nasa.gov>, Stefan Rahmstorf <rahmstorf@pik-potsdam.de>, Eric Steig <steig@ess.washington.edu>

someone pointed this out today:

[http://archives.seattletimes.nwsourc.com/cgi-bin/taxis.cgi/web/vortex/display?  
c=1&slug=mercury29m&date=20040729&query=willie+soon](http://archives.seattletimes.nwsourc.com/cgi-bin/taxis.cgi/web/vortex/display?c=1&slug=mercury29m&date=20040729&query=willie+soon)

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Professor Michael E. Mann  
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University of Virginia  
Charlottesville, VA 22903

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e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: away from my mail  
From: "Michael E. Mann" <mem6u@multiproxy.evsc.Virginia.EDU>  
Date: 8/25/04 9:35 AM  
To: mhughes@lrr.arizona.edu

I will be travelling and away from my email from Aug 20-31.

Emails sent during this period may be discarded without being read. If your message concerning "Re: mxd data" is important, it should be resent after September 1.

Subject: J. Climate paper (in press)  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 9/1/04 3:54 PM  
To: "Malcolm Hughes" <mhughes@ltr.arizona.edu>

---

Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

---

e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Attachments:

mczc-jclimate-inpress04.pdf 478 KB

Subject: J. Climate paper in press--should feel free to send on to colleagues now!  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 9/14/04 12:48 PM  
To: "Malcolm Hughes" <mhughes@ltr.arizona.edu>

Hi Malcolm,

here's the paper. Will have Scott check w/ AMS on embargo policy.

I believe that Caspar intends to do an NCAR press release when their paper is published. By the way, he will be at AGU, and at the same session. You should definitely discuss this w/ him when you see him next week!

talk to you later,

mike

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Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

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e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Attachments:

rutherford et al. J.Clim..pdf 1.6 MB

Subject: J Climate copyright forms  
From: Scott Rutherford <srutherford@rwu.edu>  
Date: 9/17/04 8:00 AM  
To: Mann Mike <mann@virginia.edu>, Bradley Raymond <rbradley@geo.umass.edu>, Hughes Malcolm <mhughes@lrr.arizona.edu>, Osborn Tim <t.osborn@uea.ac.uk>, Briffa Keith <k.briffa@uea.ac.uk>, Jones Phil <p.jones@uea.ac.uk>

Dear All,

Attached is a PDF file of the Journal of Climate copyright form. They have faxed versions that everyone sent when we originally submitted, but the need originals now. Please fill the form out and mail it to:

Andrew Weaver, Editor, Journal of Climate  
3964 Gordon Head Road, Rm 296  
Victoria, BC V8N 3X3 Canada

Thanks very much.

Regards,

Scott

---

Dr. Scott Rutherford  
Assistant Professor  
Dept. of Natural Sciences  
Roger Williams University  
e-mail: srutherford@rwu.edu  
<http://fox.rwu.edu/~rutherford>  
phone: (401) 254-3208  
snail mail:  
One Ferry Road  
Bristol, RI 02809

Attachments:  
AMS\_copyright\_transfer.pdf 98.1 KB

Subject: from Rosalind Cotter  
From: Malcolm Hughes <mhughes@ltr.arizona.edu>  
Date: 9/23/04 9:37 AM  
To: michael E. Mann <mann@virginia.edu>, rbradley@geo.umass.edu

----- Forwarded message follows -----

----- End of forwarded message -----

Subject: Re: from Rosalind Cotter  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 9/23/04 9:24 AM  
To: "Malcolm Hughes" <mhughes@ltr.arizona.edu>

Malcolm,

there is no message!

mike

At 12:37 PM 9/23/2004, you wrote:

> ----- Forwarded message follows -----

>

> ----- End of forwarded message -----Malcolm Hughes

> Professor of Dendrochronology

> Laboratory of Tree-Ring Research

> University of Arizona

> Tucson, AZ 85721

> 520-621-6470

> fax 520-621-8229

---

Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

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e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: Re: from Rosalind Cotter  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 9/23/04 10:20 AM  
To: "Malcolm Hughes" <mhughes@ltr.arizona.edu>, rbradley@geo.umass.edu

Malcolm,

You didn't forward us anything!

mike

At 12:37 PM 9/23/2004, Malcolm Hughes wrote:

> ----- Forwarded message follows -----  
>  
> ----- End of forwarded message ----- Malcolm Hughes  
> Professor of Dendrochronology  
> Laboratory of Tree-Ring Research  
> University of Arizona  
> Tucson, AZ 85721  
> 520-621-6470  
> fax 520-621-8229

---

Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

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e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: Fwd: paleo paper under Science embargo, but hoping to discuss  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 9/27/04 11:36 AM  
To: Phil Jones <p.jones@uea.ac.uk>, Malcolm Hughes <mhughes@ltrr.arizona.edu>

> X-Sender: anrevk@smtp-store.nytimes.com  
> X-Mailer: QUALCOMM Windows Eudora Version 6.1.2.0  
> Date: Mon, 27 Sep 2004 12:13:44 -0400  
> To: tcrowley@duke.edu, mann@virginia.edu, rbradley@geo.umass.edu,  
> jto@u.arizona.edu  
> From: Andy Revkin <anrevk@nytimes.com>  
> Subject: paleo paper under Science embargo, but hoping to discuss  
> X-UVA-Virus-Scanned: by amavisd-new at fork12.mail.virginia.edu  
>  
> So Science this week (thursday in ScienceExpress) is publishing what seems to be a significant reanalysis of climate  
variability in past by von storch et al, with a generally-buttrressing commentary by Briffa & Osborne.  
>  
> Please do NOT redistribute the papers attached because they're under strict embargo til thurs afternoon.  
>  
> I need some input from y'all on this, of course.  
>  
> Can you let me know when we can talk? ideally by end of tuesday because with a paper like this there is decent  
chance someone (particularly Euro press or washington times types) will jump the gun and embargo will be broken.  
>  
>  
>  
>  
>  
> Andrew C. Revkin, Environment Reporter, The New York Times  
> 229 West 43d St. NY, NY 10036  
> Tel: 212-556-7326, Fax: 509-357-0965 (via www.efax.com, received as email)  
>  
>  
>  
>

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Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

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e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Attachments:

WarmStorchComment.pdf 209 KB  
Warmvonstorch-10-01-04.pdf 588 KB

Subject: away from my mail  
From: "Michael E. Mann" <mem6u@multiproxy.evsc.Virginia.EDU>  
Date: 11/4/04 5:13 PM  
To: mhughes@lrr.arizona.edu

I will be travelling and away from my email from November 4-11.

Emails sent during this period may be discarded without being read. If your message concerning "a little light on a dark day" is important, it should be resent after November 11.

Subject: FW: this explains a lot!

From: Raymond Bradley <rbradley@geo.umass.edu>

Date: 11/5/04 12:11 PM

To: jane@eclogite.geo.umass.edu, Rob.Bradley@ukgateway.net, deconto@geo.umass.edu, bradbury@geo.umass.edu, sjs@geo.umass.edu, mlw@eclogite.geo.umass.edu, frank@geo.umass.edu, besonen@geo.umass.edu, harvey.weiss@yale.edu, mretelle@abacus.bates.edu, mhughes@ltr.arizona.edu, mann@multiproxy.evsc.virginia.edu

> From: "Miller, Jessi E" <JEMILLER@BOSTON.CBS.COM>

> To: "Ray" <rbradley@geo.umass.edu>,  
>  
>

> Interesting table...he says that he makes no claim for/against the validity of it...but if it's accurate, it explains a lot :)

>  
> <http://chrisevans3d.com/files/iq.htm>  
>

> [http://blog.evankai.com/red\\_v\\_blue\\_avg\\_personal\\_income.php](http://blog.evankai.com/red_v_blue_avg_personal_income.php)  
>

Raymond S. Bradley  
Director, Climate System Research Center\*  
Department of Geosciences, University of Massachusetts  
Morrill Science Center  
611 North Pleasant Street  
AMHERST, MA 01003-9297

Tel: 413-545-2120

Fax: 413-545-1200

\*Climate System Research Center: 413-545-0659

<<http://www.paleoclimate.org> <<http://www.paleoclimate.org/>> >

Paleoclimatology Book Web Site: <http://www.geo.umass.edu/climate/paleo/html>

Publications (download .pdf files): <http://www.geo.umass.edu/faculty/bradley/bradleypub.html>

Subject: (Fwd) Re: [Trl-1] new web site  
From: Malcolm Hughes <mhughes@ltrr.arizona.edu>  
Date: 12/10/04 2:15 PM  
To: mann@virginia.edu

Mike - I thought you might be interested in this response,  
Cheers, Malcolm

----- Forwarded message follows -----

Return-Path: <tswetnam@ltrr.arizona.edu>

Received: fromno schulman.ltrr.arizona.edu ([unix socket])

by schulman.ltrr.arizona.edu (Cyrus v2.1.9) with LMTP; Fri, 10 Dec 2004 14:08:18 -0700

X-Sieve: CMU Sieve 2.2

Received: from ring.ltrr.arizona.edu (ring.ltrr.arizona.edu [128.196.218.202])

by schulman.ltrr.arizona.edu (8.12.8/8.12.2/LTRR) with ESMTP id iBAL8Iqu015765  
for <mhughes@schulman.ltrr.arizona.edu>; Fri, 10 Dec 2004 14:08:18 -0700

Received: from gci-net.com (mail.gci-net.com [216.183.68.100])

by ring.ltrr.arizona.edu (8.12.10/8.12.10/LTRR) with ESMTP id iBAL8HLI006175  
for <mhughes@ltrr.arizona.edu>; Fri, 10 Dec 2004 14:08:17 -0700

Received: from [216.183.76.36] (account tswetnam HELO SEGI2)

by gci-net.com (CommuniGate Pro SMTP 4.1.5)

with ESMTP id 10803544 for mhughes@ltrr.arizona.edu; Fri, 10 Dec 2004 14:04:51 -0700

Message-ID: <001001c4defc5f0b08a0\$6401a8c0@SEGI2>

Reply-To: "Thomas Swetnam" <tswetnam@ltrr.arizona.edu>

From: "Thomas Swetnam" <tswetnam@ltrr.arizona.edu>

To: "Malcolm Hughes" <mhughes@ltrr.arizona.edu>

References: <41B98B42.744.37C947@localhost>

Subject: Re: [Trl-1] new web site

Date: Fri, 10 Dec 2004 14:08:15 -0700

MIME-Version: 1.0

Content-Type: text/plain;

format=flowed;

charset="iso-8859-1";

reply-type=original

Content-Transfer-Encoding: 7bit

X-Priority: 3

X-MSMail-Priority: Normal

X-Mailer: Microsoft Outlook Express 6.00.2900.2180

X-MimeOLE: Produced By Microsoft MimeOLE V6.00.2900.2180

Malcolm,

This looks good. I hope there will be some response to or  
discussion  
of the new Michael Crichton book. I just read a review of it,  
and  
then saw at Cosco. Its a novel with wacko environmentalists  
and  
politically motivated climatologists, and he includes a screed  
attacking climate change science in an appendix, plus a  
bibliography  
with anti-climate change papers ... the usual suspects..none of  
the  
Mann et al papers cited. According to the review I read,

Crichton is  
a right winger, and has used his book plots in the past to push  
his  
views.

Tom

----- Original Message -----

From: "Malcolm Hughes" <mhughes@ltrr.arizona.edu>

To: <trl-1@ltrr.arizona.edu>

Sent: Friday, December 10, 2004 11:40 AM

Subject: [Trl-1] new web site

> > Colleagues in the Lab may be interested in a new website established  
> > by a group of distinguished climate scientists: [www.realclimate.org](http://www.realclimate.org)

> >

> > .

> > .

> > .Malcolm Hughes

> > Professor of Dendrochronology

> > Laboratory of Tree-Ring Research

> > University of Arizona

> > Tucson, AZ 85721

> > 520-621-6470

> > fax 520-621-8229

> >

> >

> > \_\_\_\_\_  
> > Trl-1 mailing list

> > [Trl-1@ltrr.arizona.edu](mailto:Trl-1@ltrr.arizona.edu)

> > <https://schulman.ltrr.arizona.edu/mailman/listinfo/trl-1>

> >

----- End of forwarded message -----

Subject: away from my mail  
From: "Michael E. Mann" <mem6u@multiproxy.evsc.Virginia.EDU>  
Date: 1/10/05 11:54 AM  
To: mhughes@ltrr.arizona.edu

I will be travelling and away from my email from Jan 5-12.  
Emails sent during this period may be discarded without being read. If your message concerning "how are you" is important, it should be resent after January 12 .

Subject: JGR atmospheres paper  
From: "Zhang, Zhihua" <zz9t@virginia.edu>  
Date: 1/17/05 10:15 AM  
To: "Hughes Malcolm" <mhughes@ltr.arizona.edu>, <fenbiao@ltr.arizona.edu>

Dear Prof. Hughes,

Attached is Mike and mine recent paper titled "Coupled patterns of spatiotemporal variability in Northern Hemisphere sea level pressure and conterminous U.S. drought", which will be published in JGR atmospheres.

Comments and suggestions associated with this paper and the potential further studies in this field will be very appreciated.

Many thanks,

Zhang

---

Zhang, Zhihua  
Graduate Student - Atmospheric Science  
Department of Environmental Sciences  
Clark Hall, University of Virginia  
Charlottesville, VA 22904  
ph: (434) 924-4669 fax: (434) 982-2137  
zz9t@virginia.edu

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Attachments:  
2004JD004896.pdf 786 KB

Subject: away from my mail  
From: "Michael E. Mann" <mem6u@multiproxy.evsc.Virginia.EDU>  
Date: 1/27/05 6:41 PM  
To: mhughes@ltrr.arizona.edu

I will travelling and away from my email from Jan 27-Feb 2.

Emails sent during this period may be discarded without being read. If your message concerning  
"Re: itrdb and my database"  
is important, it should be resent after Feb 2.

Subject: on the lighter side...

From: "Michael E. Mann" <mann@virginia.edu>

Date: 1/27/05 9:11 PM

To: Gavin Schmidt <gschmidt@giss.nasa.gov>, Stefan Rahmstorf <rahmstorf@pik-potsdam.de>, "Raymond s. bradley" <rbradley@geo.umass.edu>, Phil Jones <p.jones@uea.ac.uk>, mhughes@ltrr.arizona.edu, Andrew Weaver <weaver@uvic.ca>

<http://www.cse.unsw.edu.au/~lambert/parody/tcs/>

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Professor Michael E. Mann

Department of Environmental Sciences, Clark Hall

University of Virginia

Charlottesville, VA 22903

---

e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137

<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: away from my mail  
From: "Michael E. Mann" <mem6u@multiproxy.evsc.Virginia.EDU>  
Date: 2/3/05 5:30 PM  
To: mhughes@lrr.arizona.edu

I will travelling and away from my email from Feb 3-6.

Emails sent during this period may be discarded without being read. If your message concerning "Re: Ice core data inventory" is important, it should be resent after Feb 6.

Subject: Re: interesting soil-air temp relationships

From: "Michael E. Mann" <mann@virginia.edu>

Date: 2/15/05 4:54 PM

To: Scott Rutherford <srutherford@rwu.edu>, Bradley Raymond <rbradley@geo.umass.edu>, Hughes Malcolm <mhughes@ltrr.arizona.edu>

thanks Scott

just back from travels... here's the paper,

Mike

At 05:07 PM 2/15/2005, Scott Rutherford wrote:

> JOURNAL OF GEOPHYSICAL RESEARCH, VOL. 110, D03112, doi:10.1029/2004JD004910, 2005

>

>

> Soil temperature in Canada during the twentieth century: Complex responses to atmospheric climate change

>

> I haven't seen the article, but the abstract looks interesting.

>

> -scott

>

> Yu Zhang

> Canada Centre for Remote Sensing, Natural Resources Canada, Ottawa, Ontario, Canada

> Wenjun Chen

> Canada Centre for Remote Sensing, Natural Resources Canada, Ottawa, Ontario, Canada

> Sharon L. Smith

> Geological Survey of Canada, Natural Resources Canada, Ottawa, Ontario, Canada

> Daniel W. Riseborough

> Geological Survey of Canada, Natural Resources Canada, Ottawa, Ontario, Canada

> Josef Cihlar

> Canada Centre for Remote Sensing, Natural Resources Canada, Ottawa, Ontario, Canada

>

> Abstract

>

> Most climate records and climate change scenarios projected by general circulation models are for atmospheric conditions. However, permafrost distribution as well as ecological and biogeochemical processes at high latitudes is mainly controlled by soil thermal conditions, which may be affected by atmospheric climate change. In this paper, the changes in soil temperature during the twentieth century in Canada were simulated at 0.5° latitude/longitude spatial resolution using a process-based model. The results show that the mean annual soil temperature differed from the mean annual air temperature by 0.7°C, with a national average of 2.5°C. Soil temperature generally responded to the forcing of air temperature but in complex ways. The changes in annual mean soil temperature during the twentieth century differed from that of air temperature by 0.3°C from place to place, and the difference was more significant in winter and spring. On average, for the whole of Canada the annual mean soil temperature at 20 cm depth increased by 0.6°C, while the annual mean air temperature increased by 1.0°C. Three mechanisms were investigated to explain this differentiation: air temperature change, which altered the thickness and duration of snow cover, thereby altering the response of soil temperature; seasonal differences in changes of air temperature; and changes in precipitation. The first two mechanisms generally buffer the response of soil temperature to changes in air temperature, while the effect of precipitation is significant and varies with time and space. This complex response of soil temperature to changes in air temperature and precipitation would have significant implications for the impacts of climate change.

>

> Dr. Scott Rutherford  
> Assistant Professor  
> Dept. of Natural Sciences  
> Roger Williams University  
> e-mail: [srutherford@rwu.edu](mailto:srutherford@rwu.edu)  
> <http://fox.rwu.edu/~rutherfo>  
> phone: (401) 254-3208  
> snail mail:  
> One Ferry Road  
> Bristol, RI 02809 </blockquote></x-html>

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Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

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e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Attachments:  
2004JD004910.pdf 943 KB

Subject: another real winner in GRL!

From: "Michael E. Mann" <mann@virginia.edu>

Date: 2/16/05 7:09 PM

To: Tom Wigley <wigley@ucar.edu>, Ben Santer <santer1@llnl.gov>, rbradley@geo.umass.edu, mhughes@ltr.arizona.edu

they should have saved this one for the April 1st edition...

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<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Attachments:

DouglasetalGRL05.pdf 332 KB

Subject: Away from my mail.  
From: "Michael E. Mann" <mem6u@holocene.evsc.virginia.edu>  
Date: 2/17/05 10:12 PM  
To: mhughes@ltrr.arizona.edu

I am travelling through February 22, 2005 and unable to read your email concerning "Re: Ice core data inventory".

Any email sent before then may be discarded and unread. If your message is important, please resend after February 22.

Subject: Re: PNAS paper of possible interest  
From: "Michael E. Mann" <mann@holocene.evsc.virginia.edu>  
Date: 3/1/05 1:35 PM  
To: John Smol <smolj@biology.queensu.ca>  
CC: Malcolm Hughes <mhughes@ltrr.arizona.edu>, Ray Bradley <rbradley@climate1.geo.umass.edu>

Dear John,

Thanks very much for sending--looks very interesting, and very timely given the recent Arctic Assessment, etc. Will look forward to reading in more detail,

Mike

At 02:46 PM 3/1/05, John Smol wrote:

> Hi Dr. Mann (copy Ray and Malcolm):  
> I just got a pdf copy of the on line version of a PNAS paper that just came out on our lake core work. It is getting quite a bit of press. I thought you might be intrested in it.

> Some more info etc and pictures is at:

> <http://biology.queensu.ca/~pearl/PNAS2005.htm>

> John

>

---

> John P. Smol, FRSC

> Professor

> Canada Research Chair in Environmental Change

> Editor, Journal of Paleolimnology

> Editor, Environmental Reviews

>

> Paleoecological Environmental Assessment and Research Lab (PEARL)

> Dept. Biology, 116 Barrie St.

> Queen's University

> Kingston, Ontario K7L 3N6, Canada

> Phone: (613) 533-6147; FAX: (613) 533-6617

> E-mail: SmolJ@BIOLOGY.QueensU.Ca

>

> PEARL <http://biology.queensu.ca/~pearl/>

> New Textbook <http://biology.queensu.ca/~pearl/textbook.htm>

> J. Paleolimnology <http://www.umanitoba.ca/geoscience/paleolim/jopl.html>

> Environmental Reviews [http://pubs.nrc-cnrc.gc.ca/cgi-bin/rp/rp2\\_desc\\_e?er](http://pubs.nrc-cnrc.gc.ca/cgi-bin/rp/rp2_desc_e?er)

> DPER Book Series <http://home.cc.umanitoba.ca/~mlast/paleolim/dper.html>

>

>

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Professor Michael E. Mann  
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<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: out in "Science Express"

From: "Michael E. Mann" <mann@virginia.edu>

Date: 3/5/05 6:17 AM

To: rbradley@geo.umass.edu, mhughes@ltrr.arizona.edu, Keith Briffa <k.briffa@uea.ac.uk>, Phil Jones <p.jones@uea.ac.uk>, jto@u.arizona.edu, Caspar Ammann <ammann@ucar.edu>, "Wahl, Eugene R" <wahl@alfred.edu>

FYI,

mike

---

Professor Michael E. Mann  
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---

e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Attachments:

OerlemansScience05.pdf 1.2 MB

Subject: a couple papers  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 3/9/05 7:26 PM  
To: rbradley@geo.umass.edu, mhughes@ltrr.arizona.edu

Ray, Malcolm:

I'm attaching drafts of some papers I've mentioned, but not sure I've sent you, in the two following emails...

Mike

---

Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

---

e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: pretty good piece in today's "Washington Times"

From: "Michael E. Mann" <mann@virginia.edu>

Date: 4/4/05 9:27 AM

To: rbradley@geo.umass.edu, mhughes@ltrr.arizona.edu, Caspar Ammann <ammann@ucar.edu>, "Eugene R" <wahle@alfred.edu>, "Phil Jones" <p.jones@uea.ac.uk>

<http://washingtontimes.com/upi-breaking/20050401-080237-5213r.htm>

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<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: Shindell et al  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 4/20/05 3:22 PM  
To: Malcolm Hughes <mhughes@ltr.arizona.edu>

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<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Attachments:  
Shindelletal-jgr04.pdf 3.6 MB

Subject: NCAR press release

From: "Michael E. Mann" <mann@virginia.edu>

Date: 5/11/05 11:51 AM

To: Mike MacCracken <mmaccrac@comcast.net>, Michael Oppenheimer <omichael@Princeton.EDU>, mhughes@ltr.arizona.edu, Phil Jones <p.jones@uea.ac.uk>, tim Osborn <t.osborn@uea.ac.uk>, Keith Briffa <k.briffa@uea.ac.uk>, jto@u.arizona.edu, Andrew Weaver <weaver@uvic.ca>, asocci@cox.net

Dear All,

Thought you might be interested in this press release from NCAR, just out this morning...

mike

---

Wed May 11 10:59:45 2005 Pacific Time

The Hockey Stick Controversy: New Analysis Reproduces Graph of Late 20th Century Temperature Rise; NCAR Paleoclimatologist Available to Comment

BOULDER, Colo., May 11 (AScribe Newswire) -- Caspar Ammann, a paleoclimatologist at the National Center for Atmospheric Research (NCAR), is available to comment on the so-called hockey stick controversy discussed by Stephen McIntyre and Ross McKittrick today at the National Press Club in Washington, D.C. The hockey stick refers to the shape of a frequently cited graph of global mean temperature that shows a rapid rise between 1900 and 2000 after 900 years of relative stability. The graph first appeared in a research paper by Michael Mann, Raymond Bradley, and Malcolm Hughes published in the journal Nature in 1998.

Ammann and Eugene Wahl of Alfred University have analyzed the Mann-Bradley-Hughes (MBH) climate field reconstruction and reproduced the MBH results using their own computer code. They found the MBH method is robust even when numerous modifications are employed. Their results appear in two new research papers submitted for review to the journals Geophysical Research Letters and Climatic Change. The authors invite researchers and others to use the code for their own evaluation of the method.

Ammann and Wahl's findings contradict an assertion by McIntyre and McKittrick that 15th century global temperatures rival those of the late 20th century and therefore make the hockey stick-shaped graph inaccurate. They also dispute McIntyre and McKittrick's alleged identification of a fundamental flaw that would significantly bias the MBH climate reconstruction toward a hockey stick shape. Ammann and Wahl conclude that the highly publicized criticisms of the MBH graph are unfounded. They first presented their detailed analyses at the American Geophysical Union's Fall Meeting in San Francisco last December and at the American Association of Geographers Annual Meeting in Denver this year.

McIntyre and McKittrick's papers were published in Energy and Environment (2003 and 2005) and in Geophysical Research Letters (2005).

NCAR'S primary sponsor is the National Science Foundation. Opinions, findings, conclusions, or recommendations expressed in this publication do not necessarily reflect the views of the National Science Foundation.

- - - -

CONTACTS: Anatta, NCAR Media Relations, 303-497-8604, anatta@ucar.edu

Caspar Ammann, NCAR Climate and Global Dynamics Division, 303-497-1705, ammann@ucar.edu

Eugene Wahl, Alfred University, 607-871-2604, wahle@alfred.edu

ON THE WEB:

Re-evaluation of the Mann-Bradley-Huges climate reconstruction:

[http://www.cgd.ucar.edu/ccr/ammann/millennium/MBH\\_reevaluation.html](http://www.cgd.ucar.edu/ccr/ammann/millennium/MBH_reevaluation.html)

Climate Web site explaining the hockey stick issues:

<http://www.realclimate.org/index.php?p=121>

Round table at the National Press Club today:

<http://www.marshall.org/subcategory.php?id=24>

Find this media advisory on the Web at

<http://www.ucar.edu/news/releases>

To receive NCAR and UCAR press releases via e-mail or to unsubscribe, send name, title, affiliation, postal address, fax, and phone number to [yvonnem@ucar.edu](mailto:yvonnem@ucar.edu).

Media Contact: Anatta, 303-497-8604, [anatta@ucar.edu](mailto:anatta@ucar.edu) Caspar Ammann, 303-497-1705, [ammann@ucar.edu](mailto:ammann@ucar.edu)  
Eugene Wahl, 607-871-2604, [wahle@alfred.edu](mailto:wahle@alfred.edu)

Mike

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Professor Michael E. Mann  
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e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: EGS abstract  
From: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>  
Date: 11/30/99 2:18 PM  
To: mhughes@ltrr.arizona.edu

Hi Malcolm,

Hope you had a good thanksgiving...

I'm going to need to send of the EGS abstract before I leave for San Fran, so if you have any comments please get them to me. Otherwise, I'll assume you're ok w/ it. cheers,

mike

---

Professor Michael E. Mann  
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---

e-mail: mann@virginia.edu Phone: (804) 924-7770 FAX: (804) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.html>

Subject: Re: Fwd: TAR 1000-year temperature record.  
From: Malcolm Hughes <mhughes@ltrr.arizona.edu>  
Date: 4/20/00 10:25 AM  
To: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>  
CC: mmaccrac@usgcrp.gov

DearMike (Mann) - again many thanks for forwarding this. I particularly like Michael MacCracken's reference to a 'tar pit' - wonderfully appropriate metaphor. The way these guys are working reminds me very much of my encounters with the 'Creation Science' people. It seems they feel no obligation to know the literature. As for the 'historical fact' stuff, they might benefit from reading Pierre Alexandre's Ph.D. dissertation (Alexandre, P.: 1987, Le Climat en Europe au Moyen Age, *Annales des Hautes Études en Sciences Sociales*, Paris), in which he takes much amateur historical climatology apart fiber by fiber, or some of the work of Tom Wigley et al on this topic (Ingram, M. J., Underhill, D. J., and Wigley, T. M. L.: 1978, "Historical climatology," *Nature*, 276, 329-334; Ingram, M. J., Underhill, D. J., and Farmer, G.: 1981, "The use of documentary sources for the study of past climates," in *Climate and History*, T. M. L. Wigley, M.J.Ingram and G.Farmer (eds.), Cambridge University Press, 180-213.

. CHeers, Malcolm

Subject: Re: Virus alert  
From: Jeffrey Park <jeffrey.park@yale.edu>  
Date: 11/18/00 9:31 PM  
To: "Michael E. Mann" <mann@virginia.edu>  
CC: jeffrey.park@yale.edu, mhughes@ltrr.arizona.edu

Michael & Malcolm,

Yuk! Well, Ill be online much of Sunday -- I have old versions of several files if needed.

Jeffrey

Subject: Great PAGES/CLIVAR opportunity  
From: Jonathan Overpeck <jto@u.arizona.edu>  
Date: 3/18/01 1:46 PM  
To: Typhoon@www.asiaa.sinica.edu.tw, rja@dar.csiro.au, Sandy.Tudhope@ed.ac.uk, jdcarrig@faro.ens.uabc.mx, mkg154@anu.edu.au, recy@ccrv.obs-vlfr.fr, Hantoro@geotek.lipi.go.id, matsumot@ihas.nagoya-u.ac.jp, drdendro@lamont.lidgo.columbia.edu, schrag@eps.harvard.edu, wbeck@physics.arizona.edu, schakrab@chem.ucsd.edu, blinsley@cnsunix.albany.edu, pjw@oz.colorado.edu, acohen@cliff.who.edu, ds27527@uafsysb.uark.edu, quinn@seas.marine.usf.edu, swart@ojl.rsmas.miami.edu, trenbert@ncar.ucar.edu, lgthomps@magnus.acs.ohio-state.edu, fred@utig.ig.utexas.edu, david@atmos.washington.edu, ccharles@ucsd.edu, edruffel@uci.edu, wellington@uh.edu, grottoli@uci.edu, guilderson1@popeye.llnl.gov, mevans@fas.harvard.edu, J.LOUGH@AIMS.GOV.AU, khughen@who.edu, clement@rosie.lidgo.columbia.edu, ottobli@ucar.edu, Thierry.Correge@noumea.ird.nc, Tim.Palmer@ecmwf.int, berger@astr.ucl.ac.be, jto@u.arizona.edu, jwillebrand@ifm.uni-kiel.de, broecker@ldeo.columbia.edu, Ammann@ips.unibe.ch, b.buckley@iasos.utas.edu.au, druid@lamont.lidgo.columbia.edu, jackson@uwyo.edu, schrag@eps.harvard.edu, Lkeigwin@who.edu, jek@facstaff.wisc.edu, znl@ocean.meteor.wisc.edu, taylor13@llnl.gov, elsa.cortijo@lsce.cnrs-gif.fr, Andrey.Ganopolski@pik-potsdam.de, Brian.Huntley@Durham.ac.uk, atte.korhola@helsinki.fi, markgraf@spot.colorado.edu, raynaud@glaciog.ujf-grenoble.fr, stocker@climate.unibe.ch, Fabio.Trincardi@igm.bo.cnr.it, ralley@essc.psu.edu, Malcolm hughes <mhughes@ltrr.arizona.edu>, tswetnam@ltrr.arizona.edu, roger@hwr.arizona.edu, uligraf@obelix.saclay cea.fr, chm@uqam.ca, eito@umn.edu, claussen@pik-potsdam.de, peter@ldeo.columbia.edu, gasse@cerege.fr, sandy.harrison@bgc-jena.mpg.de, syljous@asterix.saclay cea.fr, zoli@uni-bremen.de, jean-claude.duplessy@lsce.cnrs-gif.fr, wanner@giub.unibe.ch, rbradley@geo.umass.edu, k.briffa@uea.ac.uk, latif@dkrz.de, jfbmitchell@meto.gov.uk, matti.saarnisto@gsf.fi, keith.alverson@pages.unibe.ch, dirk.verschuren@rug.ac.be, Isabelle Larocque <isabelle.larocque@pages.unibe.ch>  
CC: jto@u.arizona.edu

Great PAGES/CLIVAR opportunity  
Hi Friends of CLIVAR, PAGES and/or climate variability -

Although this is a bit last minute, it is not too late to think about SUBMITTING AN ABSTRACT and going to the IGBP Open Science Conference, July 10-13, 2001 in Amsterdam.

<http://www.sciconf.igbp.kva.se/fr.html>

In addition to a great venue, there will be many sessions that will interest you. In particular, there will be several excellent paleo sessions, including one invited session focused on PAGES-CLIVAR science organized by Keith Alverson. Moreover, there will a PAGES-CLIVAR poster cluster entitled "PAGES/CLIVAR Intersection: Climate Variability" and WE URGE YOU TO SUBMIT AN ABSTRACT BEFORE THE DEADLINE of MARCH 31.

Act FAST and send an abstract in. For details on how to do this, go to the www site above and follow directions.

PLEASE NOTE ==> Make sure you submit your abstract before March 31!!

PLEASE NOTE ==> Make sure you send Isabelle Larocque <isabelle.larocque@pages.unibe.ch> and email with your title and author list, so she can make sure it is included in the cluster.

This will be a great way to get your work recognized by the broader global change community, and also to meet many of your colleagues. Moreover, PAGES is going to put more focus on PAGES/CLIVAR interaction in the future, and this is a good way to get involved.

If you have any questions, please contact Isabelle Larocque <isabelle.larocque@pages.unibe.ch> at the PAGES Office.

Many thanks, and see you in Amsterdam.

Cheers, Peck

--

Jonathan T. Overpeck  
Director, Institute for the Study of Planet Earth  
Professor, Department of Geosciences

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[http://www.geo.arizona.edu/Faculty\\_Pages/Overpeck.J.html](http://www.geo.arizona.edu/Faculty_Pages/Overpeck.J.html) <http://www.ispe.arizona.edu/>

Subject: Science letters in June 15th edition  
From: "Raymond S. Bradley" <rbradley@geo.umass.edu>  
Date: 6/15/01 5:56 AM  
To: mann@multiproxy.evsc.virginia.edu, mhughes@ltrr.arizona.edu, p.jones@uea.ac.uk, k.briffa@uea.ac.uk, tom@ocean.tamu.edu  
CC: alverson@pages.unibe.ch, pedersen@eos.ubc.ca

They edited out some key sentences, so these no longer make as much sense.....but what can you do? Somebody up there has no appreciation for the subtleties of language.

At least these are finally out:

<http://www.sciencemag.org/cgi/content/full/292/5524/2011a>  
<http://www.sciencemag.org/cgi/content/full/292/5524/2011a>

ray

Raymond S. Bradley  
Professor and Head of Department  
Department of Geosciences  
University of Massachusetts  
Amherst, MA 01003-5820

Tel: 413-545-2120

Fax: 413-545-1200

Climate System Research Center: 413-545-0659

Climate System Research Center Web Page: <<http://www.geo.umass.edu/climate/climate.html>>

Paleoclimatology Book Web Site (1999): <http://www.geo.umass.edu/climate/paleo/html>

Subject: Re: sceptics attack!

From: "Michael E. Mann" <[mann@multiproxy.evsc.virginia.edu](mailto:mann@multiproxy.evsc.virginia.edu)>

Date: 9/7/01 10:10 AM

To: Stefan Rahmstorf <[rahmstorf@pik-potsdam.de](mailto:rahmstorf@pik-potsdam.de)>, Jonathan Overpeck <[jto@u.arizona.edu](mailto:jto@u.arizona.edu)>

CC: [lgthomps@magnus.acs.ohio-state.edu](mailto:lgthomps@magnus.acs.ohio-state.edu), [rbradley@climate1.geo.umass.edu](mailto:rbradley@climate1.geo.umass.edu), [jcole@geo.arizona.edu](mailto:jcole@geo.arizona.edu), Malcolm  
hughes <[mhughes@ltrr.arizona.edu](mailto:mhughes@ltrr.arizona.edu)>, Jean-Claude Duplessy <[cfr.cnrs-gif.fr](mailto:cfr.cnrs-gif.fr)>, Keith Alverson  
<[keith.alverson@pages.unibe.ch](mailto:keith.alverson@pages.unibe.ch)>, [tcrowley@nc.rr.com](mailto:tcrowley@nc.rr.com), [p.jones@uea.ac.uk](mailto:p.jones@uea.ac.uk), [drdendro@ldgo.columbia.edu](mailto:drdendro@ldgo.columbia.edu), "Henry N.  
Pollack" <[hpollack@geo.lsa.umich.edu](mailto:hpollack@geo.lsa.umich.edu)>, [menn@virginia.edu](mailto:menn@virginia.edu)

Hi Stefan,

I have to run off to teach but will reply a bit later on. As Peck mentions, there are still some legitimate uncertainties in what we do, and we're all working to address that and introduce the appropriate caveats in our current conclusions. If that's what this was all about, there would be no problem. Unfortunately, the skeptics aren't interested in a balanced or honest discussion, but rather in delivering a one-sided and deeply flawed attack that disinforms a relatively ignorant the lay public who is their target...

There are a few key points that address the most serious flaws in their line of reasoning and attack. Got to run, but will outline these in an email later on this afternoon.

Thanks for getting in touch w/ us about this. More in a bit,

mike

At 06:50 PM 9/7/01 +0200, Stefan Rahmstorf wrote:

> Hi colleagues,

>

> I think such a resolution is a good medium-term idea, but not the  
> solution to my short-term problem - I need to write a few sentences over  
> the weekend basically, and will be grateful for any suggestions. Is it  
> true that the Mann et al. compilation shows similar unusual warming in  
> the last hundred years even with the tree data not included? (I  
> apologise to Mike for only vaguely remembering his talks about this, I'm  
> afraid I didn't take notes.) That would be an important point, as the  
> written sceptics statement that I'm trying to refute specifically  
> attacks the tree ring data.

>

> Stefan  
>  
> --  
> Stefan Rahmstorf  
> Potsdam Institute for Climate Impact Research (PIK)  
> For contact details, reprints, movies & general infos see:  
> <http://www.pik-potsdam.de/~stefan>

---

Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

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e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: Re: sceptics attack!  
From: "Michael E. Mann" <[mann@virginia.edu](mailto:mann@virginia.edu)>  
Date: 9/8/01 12:04 PM  
To: Stefan Rahmstorf <[rahmstorf@pik-potsdam.de](mailto:rahmstorf@pik-potsdam.de)>, Jonathan Overpeck <[jto@u.arizona.edu](mailto:jto@u.arizona.edu)>, [lgthomps@magnus.acs.ohio-state.edu](mailto:lgthomps@magnus.acs.ohio-state.edu), [rbradley@climate1.geo.umass.edu](mailto:rbradley@climate1.geo.umass.edu), [jcole@geo.arizona.edu](mailto:jcole@geo.arizona.edu), Malcolm hughes <[mhughes@ltrr.arizona.edu](mailto:mhughes@ltrr.arizona.edu)>, Jean-Claude Duplessy <[cfr.cnrs-gif.fr](mailto:cfr.cnrs-gif.fr)>, Keith Alverson <[keith.alverson@pages.unibe.ch](mailto:keith.alverson@pages.unibe.ch)>, [tcrowley@nc.rr.com](mailto:tcrowley@nc.rr.com), [p.jones@uea.ac.uk](mailto:p.jones@uea.ac.uk), [drdendro@ldgo.columbia.edu](mailto:drdendro@ldgo.columbia.edu), "Henry N. Pollack" <[hpollack@geo.lsa.umich.edu](mailto:hpollack@geo.lsa.umich.edu)>  
CC: [mann@virginia.edu](mailto:mann@virginia.edu)

Dear Stefan (and others):

Here are two typical related erroneous claims by the skeptics, and appropriate responses:

1) "Proxies such as that used by MBH (Mann/Bradley/Hughes) don't show late 20th warming"

The warming trend in the proxy-reconstructed Northern Hemisphere temperature reconstruction closely matches that in the actual 20th century Northern Hemisphere temperature series, with no evidence of any significant trend in the residuals. The calibration interval terminates in 1980 because relatively few proxy records extend into the most recent decades (many terminate in the 1970s and early 1980s). It is thus a deliberately misleading statement to say that the reconstruction "doesn't reproduce the post 1980 warming". We don't attempt to reconstruct the post 1980 warming w/ the network at hand.

The skeptics often confuse this (intentionally?) with a largely independent observation (Briffa et al, 1998; see also followup by Vaganov, Hughes et al) of a decline in the strength of the relationship between certain types of (mostly high latitude) tree ring density records and temperature in the latter 20th century. This decline is largeely evident in only tree ring latewood density and not annual ring width data (very few of the former are used by MBH), and only appears to be a problem in the most recent decades.

2) "Problems w/ tree-ring data compromise the reliability of MBH (Mann/Bradley/Hughes)"

It is indeed the case (as you correctly recall) that we have shown that our reconstruction of the century-scale trends over the past few centuries is robust to the inclusion/disclusion of tree ring data from our proxy network (there is enough coral, ice core, and long historical data to attempt a multiproxy reconstruction w/out tree ring data over the past few centuries--such a comparison shows that the basic trends are not sensitive to using tree ring data anyways. This is

shown in the following article:

Mann, M.E., Gille, E., Bradley, R.S., Hughes, M.K., Overpeck, J.T., Keimig, F.T., Gross, W., Global Temperature Patterns in Past Centuries: An interactive presentation, Earth Interactions, 4-4, 1-29, 2000.

which is available electronically here: [http://www.ngdc.noaa.gov/paleo/ei/ei\\_cover.html](http://www.ngdc.noaa.gov/paleo/ei/ei_cover.html)

In this regard, I must take some exception to one of the statements in Henry's otherwise very informative and helpful email (which I just received now as I was ready to send this out!). We \*have\* shown in the above peer-reviewed manuscript (of which Peck is, incidentally, a co-author) that the basic trends in our Northern Hemisphere temperature reconstruction are insensitive to whether or not tree ring data are used at all! In fact, in unpublished work (hopefully soon to be published) we believe we show reasonably convincingly that a reconstruction using borehole data (based an alternative approach from that used by Henry which makes use of spatial covariance information and explicit calibration) yields again more or less the same trend! But, I agree with Henry, this is not the place for that particular debate...

I hope the above is helpful. Please let me know if I can be of further help.

Cheers,

mike

At 01:10 PM 9/7/01 -0400, Michael E. Mann wrote:

> HI Stefan,

>

> I have to run off to teach but will reply a bit later on. As Peck mentions, there are still some legitimate uncertainties in what we do, and we're all working to address that and introduce the appropriate caveats in our current conclusions. If that's what this was all about, there would be no problem. Unfortunately, the skeptics aren't interested in a balanced or honest discussion, but rather in delivering a one-sided and deeply flawed attack that disinforms a relatively ignorant the lay public who is their target...

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> mike

>

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>> afraid I didn't take notes.) That would be an important point, as the  
>> written sceptics statement that I'm trying to refute specifically  
>> attacks the tree ring data.

>>

>> Stefan

>>

>> --

>> Stefan Rahmstorf  
>> Potsdam Institute for Climate Impact Research (PIK)  
>> For contact details, reprints, movies & general infos see:  
>> <http://www.pik-potsdam.de/~stefan>

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>  
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> <http://www.evsc.virginia.edu/faculty/people/mann.shtml>

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Subject: Re: sceptics attack!

From: "Michael E. Mann" <[mann@multiproxy.evsc.virginia.edu](mailto:mann@multiproxy.evsc.virginia.edu)>

Date: 9/11/01 10:23 AM

To: Jean-Claude Duplessy <[Jean-Claude.Duplessy@lsce.cnrs-gif.fr](mailto:Jean-Claude.Duplessy@lsce.cnrs-gif.fr)>, Jonathan Overpeck <[jto@u.arizona.edu](mailto:jto@u.arizona.edu)>

CC: [lgthomps@magnus.acs.ohio-state.edu](mailto:lgthomps@magnus.acs.ohio-state.edu), [rbradley@climate1.geo.umass.edu](mailto:rbradley@climate1.geo.umass.edu), [jcole@geo.arizona.edu](mailto:jcole@geo.arizona.edu), Malcolm  
hughes <[mhughes@ltrr.arizona.edu](mailto:mhughes@ltrr.arizona.edu)>, Jean-Claude.Duplessy@lsce.cnrs-gif.fr, Keith Alverson  
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Pollack" <[hpollack@geo.lsa.umich.edu](mailto:hpollack@geo.lsa.umich.edu)>, [mann@virginia.edu](mailto:mann@virginia.edu)

Dear Jean-Claude, Peck, et al...

The currents events transpiring in the U.S. make this all seem so trivial in comparison, but a few comments:

I'm flattered by Peck and Jean-Claude's support for me to head this particular effort...

However, I'm not sure if this is likely to be most effective. The problem is that I in particular have been the focal point of many of the ad hominem attacks by the skeptics, even though it is clear that the basic message the skeptics don't like (ie, that recent temperatures are unprecedented at the hemispheric/global level over the past several centuries/millennium) follows from many of our efforts. The "skeptics" (as Malcolm points out, we need a new word for them--suggestions?) like to single me out (e.g., the "Mann reconstruction", etc.), as if my work is isolated from my collaborators and other colleagues doing similar work (Tom, Phil, Keith, Ed, Henry, etc.).

I think this effort would be more successful if a few of our more august senior colleagues were to lead this sort of effort. I know that Ray and Henry have been particularly active in trying to counter act "skeptic" disinformation campaigns here in the states. I think Peck, Tom, and Phil would be very helpful here too. It isn't just the paleo record but the observational surface temperature record which is often under attack. I think that anything that we right had to have broad authorship and representation...

I'm happy to help out, but I think its actually best if I'm not seen as the "leader" of the effort,

mike

At 04:59 PM 9/11/01 +0200, Jean-Claude Duplessy wrote:

> Hi Peck,

>  
>

> I agree with you that we need to take position. This implies writing some scientific paper and obviously we need a hero to push it, M. Mann could be the right guy, together with people from corals, ice core, etc..

> As editor of CLIMATE DYNAMICS, a journal which is well read on both sides of the Atlantic, and in particular in Europe with the EGS support, I suggest this review being submitted to CLIMATE DYNAMICS. Obviously, it will experience a large review process, but I could ensure to speed it up. Then it would be nice to have it printed and published in Germany. I think that a review in an international journal would have more impact than any grey literature coming out as IGBP report.

> cheers

> jean claude

> Jean-Claude DUPLESSY

> laboratoire des Sciences du Climat et de l'Environnement

> Laboratoire mixte CNRS-CEA

> F - 91198 Gif sur Yvette cedex

> - tel (33) 01 69 82 35 26

> - fax (33) 01 69 82 35 68

> - e-mail : Jean-Claude.Duplessy@lsce.cnrs-gif.fr

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e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: Re: sceptics attack!

From: Malcolm K. Hughes <mhughes@ltrr.arizona.edu>

Date: 9/12/01 8:01 AM

To: Phil Jones <p.jones@uea.ac.uk>

CC: <mhughes@LTRR.ARIZONA.EDU>, Keith Alverson <keith.alverson@pages.unibe.ch>, "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>, Jean-Claude Duplessy <Jean-Claude.Duplessy@lsce.cnrs-gif.fr>, Jonathan Overpeck <jto@u.arizona.edu>, <lgthomps@magnus.acs.ohio-state.edu>, <rbradley@climate1.geo.umass.edu>, <jcole@geo.arizona.edu>, Malcolm hughes <mhughes@ltrr.arizona.edu>, <Jean-Claude.Duplessy@lsce.cnrs-gif.fr>, Keith Alverson <keith.alverson@pages.unibe.ch>, <tcrowley@nc.rr.com>, <drdendro@ldgo.columbia.edu>, "Henry N. Pollack" <hpollack@geo.lsa.umich.edu>, <mann@virginia.edu>

Dear colleagues,

We have discussed a published response to the "skeptics", in particular the web-based type of critic, but I wonder if Jean-Claude had something else in

ABOR/MH/Non-Priv-00312

mind. As I understand it, the concern has arisen that a part of "established" or "official" science in Germany is planning an active campaign within the German governmental and political scene. Their intent is to question the main IPCC findings, with, in their eyes, the high-resolution paleo component as a weak point of the IPCC TAR. Because the critics are geologists, they will have credibility in these circles, and a journal article, appropriately distributed, could be a useful tool. As in the US, those with power and influence (even within our National Academy of Science) seem not to understand the difference between the scientific approaches needed to study decade to century variability as distinct from longer-term phenomena.

If my understanding is correct, I think Jean-Claude's suggestion should be followed. If we are only talking about the general problem Phil discussed, then Phil is right.

Malcolm

Quoting Phil Jones <p.jones@uea.ac.uk>:

>>  
>> Dear All,  
>> I've been bogged down with meetings and proposal writings to  
>> respond  
>> sooner, and today  
>> doesn't seem appropriate but here goes.  
>> Mike raised the issue of the observational record and with this  
>> no  
>> matter what I write or  
>> say will alter the skeptic view. CRU has had several emails thanking  
>> us  
>> for the information  
>> pages on our web site urging us to do more to counter the view.  
>> Questions  
>> I get at talks on  
>> the surface record generally cite the satellite record as showing  
>> no  
>> warming. I have a  
>> prepared answer, which I think is good, but in Britain at least there  
>> is  
>> a partial belief that  
>> scientists (and governments for some) are not to be believed (because  
>> of  
>> CJD, foot and mouth,  
>> nuclear research etc). Even though we are working in a different area  
>> the  
>> view permeates and  
>> we get tarred with the same brush. Responding to people who say we  
>> are  
>> the greenhouse  
>> industry and we say what we say to get more grants is difficult. If  
>> only  
>> they knew how  
>> difficult is to get some grants !  
>> Mike and a few of you may have been on a skeptic email list. I  
>> was

>> until recently and it  
>> has taken me about a month to get off. I used to respond and  
>> possibly  
>> changed a few  
>> minds - noticing that when I got these emails they were to me  
>> personally>  
>> and not to the  
>> group. When I responded the issues changed and a month or two later  
>> it  
>> was back to the  
>> first issue again. It was just self defeating and time wasting. I've  
>> left>  
>> it Mike MacCracken  
>> and a few others to keep replying but he's probably realising it is  
>> a  
>> lost cause.  
>> As a result of the responses I am working on a paper (not really  
>> started) with Dave  
>> Easterling at NCDC on the surface record pointing to a few facts  
>> about  
>> the surface record -  
>> Russia is warming, getting lake/river freeze dates and the like.  
>> Lonnie  
>> writing something  
>> about the demise of tropical ice caps - great talk last time we met,  
>> by  
>> the way - would be  
>> useful. Maybe it's done, but the literature is enormous now. My big  
>> hope>  
>> is a paper I know  
>> is being written with a new MSU2 series, with different corrections.  
>> The>  
>> new series shows  
>> more warming, but it means the sonde record is wrong. Obviously it  
>> is  
>> important for the  
>> authors to get it right (with Christy and Spencer as reviewers) but  
>> it  
>> all relates (for the MSU  
>> and the sondes) to diurnal cycles not being correctly accounted for.  
>> One point the skeptics have been getting at me about is this -  
>> briefly to illustrate their  
>> lack of logic. Christy et al have a paper in GRL (Vol28, 183-186)  
>> which  
>> shows that since  
>> 1979 air temperatures measured by ships and buoys in the tropics  
>> (mainly>  
>> Pacific) have  
>> not warmed as much as SSTs. I was asked by several of the skeptics  
>> when>  
>> I would be  
>> taking this into account in the gridded data. When I said I  
>> wouldn't  
>> because of the assumptions

>> I make (these are that SST is a surrogate for air temperature) I  
>> was  
>> slammed on the email  
>> list. I said I would need to have the corrections to apply spatially  
>> and  
>> by month and it was  
>> just the tropics (20N-20S, OK a large part of the Earth's surface). I  
>> do  
>> know that a paper will  
>> be submitted soon that shows that SSTs in the South Pacific agree  
>> better  
>> with island  
>> air temperatures than marine temperatures (MATs). Also the paper  
>> will  
>> show that MATs in  
>> the Pacific are being affected by the now dominance of larger  
>> container  
>> ships as we don't  
>> get access to Korean, Japanese and Taiwanese fishing fleet data  
>> until  
>> decades later.  
>> So, to writing a paper. I have written a review in Reviews of  
>> Geophysics in 1999 and there  
>> was a Science paper (with Keith and Tim) in April 2001. Both were  
>> high  
>> profile, yet seem  
>> to have little effect. They are well cited but they haven't changed  
>> any  
>> skeptics. In my opinion  
>> the satellite record is the key to all this. The millennial record  
>> got  
>> attention because it was  
>> one more thing that needed to be explained away by the skeptics, but  
>> take  
>> away the  
>> satellite record and they will melt away like the tropical ice caps.  
>> Mike is right that he isn't right person. They'll just say he got  
>> all  
>> his pals to agree that his  
>> curve is right. Whether any one else would be better is doubtful.  
>> Mike  
>> has experienced most  
>> of the verbal and web-site attacks, but there isn't much between  
>> the  
>> curves I've produced,  
>> or Keith, Tom and now Ed. Basically the LIA wasn't as cold or the MWE  
>> as  
>> warm as  
>> people believed and we are warmer now that we've been for a  
>> millennium.  
>> What the  
>> temperatures were in the 10th century may be an issue but this wasn't  
>> in  
>> the last millennium.

>> My belief is that another paper, even with a CLIVAR/PAGES  
>> product  
>> name, will do little  
>> good to allay the skeptical view. It would be good to work together  
>> but  
>> it won't achieve the  
>> particular aim. The vital piece of evidence that will be listened to  
>> is  
>> the tropical ice caps -  
>> if they are not producing layers now and have nice medieval layers,  
>> this>  
>> is pretty damning.  
>> Knowing why it is happening is something else. The scanty local  
>> records  
>> near the ice caps,  
>> don't show enough warming, but the ice is clearly going, even if  
>> the  
>> MSU2LT/MSU2 show  
>> little warming at these elevations.  
>> The skeptics are skeptical of everything, not just in the  
>> climate  
>> field. I have met a couple  
>> and been told this by a few others over email. They are mostly right  
>> wing>  
>> but I guess we all  
>> knew that. As for a new name for them - those I can think of today  
>> aren't>  
>> appropriate. Any  
>> term needs to be secular and not suggesting belief etc.  
>> As I said at the beginning this type of email doesn't seem  
>> relevant  
>> today, but life should  
>> go on - I hope it does.  
>>  
>> All the best to all of you  
>>  
>> Phil  
>>  
>>  
>>  
>> At 09:14 12/09/01 +0200, Keith Alverson wrote:  
>>> >Hi All,  
>>>>  
>>>> I agree that a high profile peer reviewed publication rather than grey  
>>>> literature is best. It may be that (some) of the worries that Mike>  
>>>> expresses  
>>>> could be alleviated by having the publication somehow appear as an  
>>>> 'official' CLIVAR/PAGES product, thereby removing some of the  
>>>> association  
>>>> with any particular author's perceived personal agenda and  
>>>> distinguishing  
>>>> this from a review paper coming from an individual or small group of  
>>>> collaborators.  
>>>>>

>>>> Should a leader nominate him/herself, and should a group of people  
>> (such as  
>>>> the email recipients of these emails or a similar one) wish to  
>> collaborate  
>>>> on such a paper oriented around debating the points of the un-skeptical  
>>>> greenhouse deniers as an official CLIVAR/PAGES product, I am confident  
>> that  
>>>> PAGES would be able to support this effort both in name and with a  
>> (small  
>>>> amount) of funding should it be required. I guess that CLIVAR would  
>> also be  
>>>> supportive.

>>>>  
>>>> Note that the recently published PAGES glossy brochure "Environmental  
>>>> Variability and Climate Change" which serves as the executive summary  
>> of> our  
>>>> (in prep) synthesis book, is in part oriented around discussing a  
>> series of  
>>>> questions often raised by these deniers (if you have not received a  
>> copy> yet  
>>>> please request it). The glossy is of course aimed at a much different  
>>>> audience than a paper in the peer reviewed literature would be.

>>>>  
>>>> Keith  
>>>> --  
>>>> Keith Alverson  
>>>> Executive Director  
>>>> PAGES International Project Office  
>>>> Bärenplatz 2, 3011 Bern  
>>>> Switzerland  
>>>> <http://www.pages-igbp.org>  
>>>> Tel: +41 31 312 31 33  
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>>>> Fax: +41 31 312 31 68

>>>>  
>>>>>> From: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>  
>>>>>> Date: Tue, 11 Sep 2001 13:23:14 -0400  
>>>>>> To: Jean-Claude Duplessy <Jean-Claude.Duplessy@lsce.cnrs-gif.fr>,>  
Jonathan  
>>>>>> Overpeck <jto@u.arizona.edu>  
>>>>>> Cc: lgthomps@magnus.acs.ohio-state.edu,  
>> rbradley@climate1.geo.umass.edu,  
>>>>>> jcole@geo.arizona.edu, Malcolm hughes <mhughes@ltrr.arizona.edu>,  
>>>>>> Jean-Claude.Duplessy@lsce.cnrs-gif.fr, Keith Alverson  
>>>>>> <keith.alverson@pages.unibe.ch>, tcrowley@nc.rr.com,  
>> p.jones@uea.ac.uk,  
>>>>>> drdendro@ldgo.columbia.edu, "Henry N. Pollack"  
>>>>>> <hpollack@geo.lsa.umich.edu>,  
>>>>>> mann@virginia.edu  
>>>>>> Subject: Re: sceptics attack!  
>>>>>>  
>>>>>> Dear Jean-Claude, Peck, et al...  
>>>>>>  
>>>>>> The currents events transpiring in the U.S. make this all seem so>

trivial

>>> > > in comparison, but a few comments:

>>> > >

>>> > > I'm flattered by Peck and Jean-Claude's support for me to head this

>>> > > particular effort...

>>> > >

>>> > > However, I'm not sure if this is likely to be most effective. The>

problem

>>> > > is that I in particular have been the focal point of many of the ad>

hominem

>>> > > attacks by the skeptics, even though it is clear that the basic

> > message> the

>>> > > skeptics don't like (ie, that recent temperatures are unprecedented

> > at> the

>>> > > hemispheric/global level over the past several

> > centuries/millennium)

>>> > > follows from many of our efforts. The "skeptics" (as Malcolm

> > points> out,

>>> > > we need a new word for them--suggestions?) like to single me out

> > (e.g.,> the

>>> > > "Mann reconstruction", etc.), as if my work is isolated from my

>>> > > collaborators and other colleagues doing similar work (Tom, Phil,

> > Keith,

>>> > > Ed, Henry, etc.).

>>> > >

>>> > > I think this effort would be more successful if a few of our more

> > august

>>> > > senior colleagues were to lead this sort of effort. I know that Ray

> > and

>>> > > Henry have been particularly active in trying to counter act

> > "skeptic"

>>> > > disinformation campaigns here in the states. I think Peck, Tom, and

> > Phil

>>> > > would be very helpful here too. It isn't just the paleo record but

> > the

>>> > > observational surface temperature record which is often under

> > attack. I

>>> > > think that anything that we right had to have broad authorship and

>>> > > representation...

>>> > >

>>> > > I'm happy to help out, but I think its actually best if I'm not seen

> > as> the

>>> > > "leader" of the effort,

>>> > >

>>> > > mike

>>> > >

>>> > > At 04:59 PM 9/11/01 +0200, Jean-Claude Duplessy wrote:

>>>> > >> Hi Peck,

>>>> > >>

>>>> > >>

>>>> > >> I agree with you that we need to take position. This implies

>>>> > >> writing some scientific paper and obviously we need a hero to push

> > it,> M.

>>>> > >> Mann could be the right guy, together with people from corals, ice>

core,  
>>>> > > >> etc..  
>>>> > > >>  
>>>> > > >> As editor of CLIMATE DYNAMICS, a journal which is well read on  
>>>> > > >> both sides of the Atlantic, and in particular in Europe with the  
> > EGS  
>>>> > > >> support,I suggest this review being submitted to CLIMATE DYNAMICS.  
>>>> > > >> Obviously, it will experience a large review process, but I could>  
ensure  
>>>> > > >> to sped it up. Then it would be nice to have it printed and  
> > published> in  
>>>> > > >> Germany. I think that a review in an international journal would  
> > have  
>>>> > > >> more impact than any grey literature coming out as IGBP report.  
>>>> > > >>  
>>>> > > >> cheers  
>>>> > > >>  
>>>> > > >> jean claude  
>>>> > > >>  
>>>> > > >> Jean-Claude DUPLESSY  
>>>> > > >> laboratoire des Sciences du Climat et de l'Environnement  
>>>> > > >> Laboratoire mixte CNRS-CEA  
>>>> > > >> F - 91198 Gif sur Yvette cedex  
>>>> > > >>  
>>>> > > >> - tel (33) 01 69 82 35 26  
>>>> > > >> - fax (33) 01 69 82 35 68  
>>>> > > >>  
>>>> > > >> - e-mail : Jean-Claude.Duplessy@lsce.cnrs-gif.fr  
>>> >> >  
>>> >> >  
> >

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>>> >> > Professor Michael E. Mann  
>>> >> > Department of Environmental Sciences, Clark Hall  
>>> >> > University of Virginia  
>>> >> > Charlottesville, VA 22903  
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>>> >> > e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434)  
> > 982-2137  
>>> >> > <http://www.evsc.virginia.edu/faculty/people/mann.shtml>  
>>> >> >

> >  
> > Prof. Phil Jones  
> > Climatic Research Unit Telephone +44 (0) 1603 592090  
> > School of Environmental Sciences Fax +44 (0) 1603 507784  
> > University of East Anglia  
> > Norwich Email p.jones@uea.ac.uk  
> > NR4 7TJ  
> > UK

> > ----->

>> >  
>>  
>>

Professor Malcolm K. Hughes  
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University of Arizona  
Tucson, AZ 85721  
phone 520-621-6470  
fax 520-621-8229

Subject: Re: sceptics attack!

From: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>

Date: 9/12/01 9:12 AM

To: "Malcolm K. Hughes" <mhughes@ltrr.arizona.edu>, Phil Jones <p.jones@uea.ac.uk>

CC: mhughes@ltrr.arizona.edu, Keith Alverson <keith.alverson@pages.unibe.ch>, Jean-Claude Duplessy <Jean-Claude.Duplessy@lsce.cnrs-gif.fr>, Jonathan Overpeck <jto@u.arizona.edu>, Igthomps@magnus.acs.ohio-state.edu, rbradley@climate1.geo.umass.edu, jcole@geo.arizona.edu, Malcolm hughes <mhughes@ltrr.arizona.edu>, Jean-Claude.Duplessy@lsce.cnrs-gif.fr, Keith Alverson <keith.alverson@pages.unibe.ch>, tcrowley@nc.rr.com, drdendro@ldgo.columbia.edu, "Henry N. Pollack" <hpollack@geo.lsa.umich.edu>

Malcolm,

Can you share w/ us the source of your information? I wasn't aware of this "campaign" and I know that mainstream German climate researchers will (e.g., Stefan Ramstorf) will not support this kind of thing. If there is such a plan, we need to consult w/ Stefan about this,

mike

At 08:01 AM 9/12/01 -0700, Malcolm K. Hughes wrote:

> Dear colleagues,  
> We have discussed a published response to the "skeptics", in particular the  
> web-based type of critic, but I wonder if Jean-Claude had something else in  
> mind. As I understand it, the concern has arisen that a part of "established" or  
> "official" science in Germany is planning an active campaign within the German  
> governmental and political scene. Their intent is to question the main IPCC  
> findings, with, in their eyes, the high-resolution paleo component as a weak  
> point of the IPCC TAR. Because the critics are geologists, they will have  
> credibility in these circles, and a journal article, appropriately distributed,  
> could be a useful tool. As in the US, those with power and influence (even  
> within our National Academy of Science) seem not to understand the difference  
> between the scientific approaches needed to study decade to century variability  
> as distinct from longer-term phenomena.  
> If my understanding is correct, I think Jean-Claude's suggestion should be  
> followed. If we are only talking about the general problem Phil discussed, then  
> Phil is right.  
> Malcolm  
>  
>  
> Quoting Phil Jones <p.jones@uea.ac.uk>:  
>  
>>

>> Dear All,  
>> I've been bogged down with meetings and proposal writings to  
>> respond>  
>> sooner, and today  
>> doesn't seem appropriate but here goes.  
>> Mike raised the issue of the observational record and with this  
>> no  
>> matter what I write or  
>> say will alter the skeptic view. CRU has had several emails thanking  
>> us  
>> for the information  
>> pages on our web site urging us to do more to counter the view.  
>> Questions>  
>> I get at talks on  
>> the surface record generally cite the satellite record as showing  
>> no  
>> warming. I have a  
>> prepared answer, which I think is good, but in Britain at least there  
>> is>  
>> a partial belief that  
>> scientists (and governments for some) are not to be believed (because  
>> of>  
>> CJD, foot and mouth,  
>> nuclear research etc). Even though we are working in a different area  
>> the>  
>> view permeates and  
>> we get tarred with the same brush. Responding to people who say we  
>> are  
>> the greenhouse  
>> industry and we say what we say to get more grants is difficult. If  
>> only>  
>> they knew how  
>> difficult is to get some grants !  
>> Mike and a few of you may have been on a skeptic email list. I  
>> was  
>> until recently and it  
>> has taken me about a month to get off. I used to respond and  
>> possibly  
>> changed a few  
>> minds - noticing that when I got these emails they were to me  
>> personally>  
>> and not to the  
>> group. When I responded the issues changed and a month or two later  
>> it  
>> was back to the  
>> first issue again. It was just self defeating and time wasting. I've  
>> left>  
>> it Mike MacCracken  
>> and a few others to keep replying but he's probably realising it is  
>> a  
>> lost cause.  
>> As a result of the responses I am working on a paper (not really  
>> started) with Dave  
>> Easterling at NCDC on the surface record pointing to a few facts

>> about  
>> the surface record -  
>> Russia is warming, getting lake/river freeze dates and the like.  
>> Lonnie  
>> writing something  
>> about the demise of tropical ice caps - great talk last time we met,  
>> by  
>> the way - would be  
>> useful. Maybe it's done, but the literature is enormous now. My big  
>> hope>  
>> is a paper I know  
>> is being written with a new MSU2 series, with different corrections.  
>> The>  
>> new series shows  
>> more warming, but it means the sonde record is wrong. Obviously it  
>> is  
>> important for the  
>> authors to get it right (with Christy and Spencer as reviewers) but  
>> it  
>> all relates (for the MSU  
>> and the sondes) to diurnal cycles not being correctly accounted for.  
>> One point the skeptics have been getting at me about is this -  
>> briefly to illustrate their  
>> lack of logic. Christy et al have a paper in GRL (Vol28, 183-186)  
>> which  
>> shows that since  
>> 1979 air temperatures measured by ships and buoys in the tropics  
>> (mainly>  
>> Pacific) have  
>> not warmed as much as SSTs. I was asked by several of the skeptics  
>> when>  
>> I would be  
>> taking this into account in the gridded data. When I said I  
>> wouldn't  
>> because of the assumptions  
>> I make (these are that SST is a surrogate for air temperature) I  
>> was  
>> slammed on the email  
>> list. I said I would need to have the corrections to apply spatially  
>> and>  
>> by month and it was  
>> just the tropics (20N-20S, OK a large part of the Earth's surface). I  
>> do>  
>> know that a paper will  
>> be submitted soon that shows that SSTs in the South Pacific agree  
>> better>  
>> with island  
>> air temperatures than marine temperatures (MATs). Also the paper  
>> will  
>> show that MATs in  
>> the Pacific are being affected by the now dominance of larger  
>> container  
>> ships as we don't  
>> get access to Korean, Japanese and Taiwanese fishing fleet data

>> until  
>> decades later.  
>> So, to writing a paper. I have written a review in Reviews of  
>> Geophysics in 1999 and there  
>> was a Science paper (with Keith and Tim) in April 2001. Both were  
>> high  
>> profile, yet seem  
>> to have little effect. They are well cited but they haven't changed  
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>> As I said at the beginning this type of email doesn't seem  
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>> >Should a leader nominate him/herself, and should a group of people  
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> > >  
> > >Keith  
> > >--  
> > >Keith Alverson  
> > >Executive Director  
> > >PAGES International Project Office  
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> > >Switzerland  
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> > > > From: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>  
> > > > Date: Tue, 11 Sep 2001 13:23:14 -0400  
> > > > To: Jean-Claude Duplessy <Jean-Claude.Duplessy@lsce.cnrs-gif.fr>,>  
> > > > Jonathan  
> > > > Overpeck <jto@u.arizona.edu>  
> > > > Cc: lgthomps@magnus.acs.ohio-state.edu,  
> > > > rbradley@climate1.geo.umass.edu,  
> > > > jcole@geo.arizona.edu, Malcolm hughes <mhughes@ltrr.arizona.edu>,  
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> > > > <keith.alverson@pages.unibe.ch>, tcrowley@nc.rr.com,  
> > > > p.jones@uea.ac.uk,  
> > > > drdendro@ldgo.columbia.edu, "Henry N. Pollack"  
> > > > <hpollack@geo.lsa.umich.edu>,  
> > > > mann@virginia.edu  
> > > > Subject: Re: sceptics attack!  
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> > > > Dear Jean-Claude, Peck, et al...  
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> > > > The currents events transpiring in the U.S. make this all seem so>  
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<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

ABOR/MH/Non-Priv-00327

Subject: Re: sceptics attack!

From: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>

Date: 9/12/01 11:23 AM

To: Malcolm Hughes <mhughes@ltrr.arizona.edu>, "Malcolm K. Hughes" <mhughes@ltrr.arizona.edu>, Phil Jones <p.jones@uea.ac.uk>

CC: mhughes@ltrr.arizona.edu, Keith Alverson <keith.alverson@pages.unibe.ch>, Jean-Claude Duplessy <Jean-Claude.Duplessy@lsce.cnrs-gif.fr>, Jonathan Overpeck <jto@u.arizona.edu>, lgthomps@magnus.acs.ohio-state.edu, rbradley@climate1.geo.umass.edu, jcole@geo.arizona.edu, Malcolm hughes <mhughes@ltrr.arizona.edu>, Jean-Claude.Duplessy@lsce.cnrs-gif.fr, Keith Alverson <keith.alverson@pages.unibe.ch>, tcrowley@nc.rr.com, drdendro@ldgo.columbia.edu, "Henry N. Pollack" <hpollack@geo.lsa.umich.edu>

Thanks Malcolm,

I didn't read that carefully enough the first time I read it.

This is disconcerting. Stefan seems to be leading the counter-effort. Perhaps we should continue to see how we can best aid him in this?

mike

At 10:16 AM 9/12/01 -0700, Malcolm Hughes wrote:

> Mike- the issue is not mainstream climatologists, by people and an  
> institute who may well be mainstream geoscientists. My comments  
> were based on my reading of Stefan's original message to Peck  
> (reproduced at the end of this message). Hope this helps, Cheers,  
> Malcolm

> Hi Jonathan,

> >

> >I thought the subject line might

> capture your attention... but

> >seriously, we're facing a concerted

> action here at the moment, a German

> >geological institute has launched a

> well-orchestrated challenge to IPCC

> >including a book launch, cover

> articles in major newspapers, a

> >simultaneous official request in the

> Bundestag, etc. They have the coal

> >industry on their side. Not surprising

> to you in the US I'm sure but a

> >novelty for germany, where so far

> the sceptics had no ground to stand

> on.

> >

> >The gist: IPCC is dominated by

> modelers and neo-climatologists;

> >paleo-climatologists were

> marginalised; if you look at the

> paleoclimatic

> >facts you come to opposite

> conclusions from the scare-mongering

> modelers,  
> >namely that CO2 plays a minor role  
> for climate and solar variability  
> >dominates everything.  
> >  
> >I need to draft a response for the  
> government and remember our Venice  
> >meeting - didn't you plan some kind  
> of resolution, emphasising that  
> >paleo-records point at the 20th  
> Century being extremely unusual, and  
> >emphasising that many records are  
> threatened due to glaciers vanishing?  
> >Does this resolution exist, so I can  
> quote it as an example of  
> >internationally leading  
> paleoclimatologists supporting IPCC  
> conclusions?  
> >In my response I want to argue that  
> these guys from the Bundesanstalt für  
> >Geowissenschaften do not represent  
> paleoclimatology, but rather are  
> >completely marginal in the  
> paleoclimatology community. (Or  
> have you heard  
> >much of them? The most prominent  
> guy is Ulrich Berner.)  
> >  
> >Specifically, they challenge Mann et  
> al. data based on the argument that  
> >tree rings are unreliable for long-  
> term trends. They claim that ice core  
> >records show climate shifts within  
> the past 2,000 years that are much  
> >larger than what happened in the  
> 20th C. Any ideas how to counter  
> this? I  
> >thought that a catchy example that  
> politicians might understand is  
> >Lonnie's problems with vanishing ice  
> on Kilimandjaro. What other clear  
> >examples do we have for the 20th C  
> being beyond normal variability? Hope  
> >that now before your baby is there  
> you might still have a few minutes to  
> >give me some advice.  
> >  
> >Cheers,  
> >Stefan  
> >  
> >  
> >  
> >  
> >--  
> >Stefan Rahmstorf

> >Potsdam Institute for Climate Impact  
> Research (PIK)  
> >For contact details, reprints, movies  
> & general infos see:  
> ><http://www.pik-potsdam.de/~stefan>  
> Malcolm Hughes  
> Professor of Dendrochronology  
> Laboratory of Tree-Ring Research  
> University of Arizona  
> Tucson, AZ 85721  
> 520-621-6470  
> fax 520-621-8229

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Subject: Eos article  
From: "Michael E. Mann" <[mann@virginia.edu](mailto:mann@virginia.edu)>  
Date: 1/7/02 1:11 PM  
To: Scott Rutherford <[srutherford@virginia.edu](mailto:srutherford@virginia.edu)>  
CC: [mann@multiproxy.evsc.virginia.edu](mailto:mann@multiproxy.evsc.virginia.edu), [mhughes@ltrr.arizona.edu](mailto:mhughes@ltrr.arizona.edu), [rbradley@geo.umass.edu](mailto:rbradley@geo.umass.edu)

Ray is right. The Eos article \*did\* appear (I don't know how I missed it).

I only have a zerox copy that doesn't have the volume on it! (its the Nov 13, 2001 edition.

Mann, M.E., Bradley, R.S., Briffa, K., Cole, J., Hughes, M.K., Overpeck, J.T., Jones, J.M., von Storch, H., Widmann, M., Wanner, H., and S.L. Weber, Reconstructing Late Holocene Climate, Eos, volume (????RAY????), pg. 553, 2001.

mike

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Subject: Slowing deforestation  
From: Jonathan Overpeck <[jto@u.arizona.edu](mailto:jto@u.arizona.edu)>  
Date: 4/3/02 4:23 PM  
To: [acohen@geo.arizona.edu](mailto:acohen@geo.arizona.edu), [ahuete@ag.arizona.edu](mailto:ahuete@ag.arizona.edu), [along@geo.arizona.edu](mailto:along@geo.arizona.edu), [baker@hwr.arizona.edu](mailto:baker@hwr.arizona.edu),  
ABOR/MH/Non-Priv-00330

barron@ag.arizona.edu, batterbu@u.arizona.edu, bbecker@u.arizona.edu, bcolby@ag.arizona.edu, bechtel@u.arizona.edu, benquist@email.arizona.edu, better@atmo.arizona.edu, bisher@hwr.arizona.edu, brittain@u.arizona.edu, brooks@hwr.arizona.edu, brown@biosci.arizona.edu, burr@physics.arizona.edu, calderwa@u.arizona.edu, caldwell@ag.arizona.edu, carlosc@u.arizona.edu, chalfoun@u.arizona.edu, chorover@ag.arizona.edu, chuck@ag.arizona.edu, comrie@climate.geog.arizona.edu, cppr@ag.arizona.edu, daustin@u.arizona.edu, davies@atmo.arizona.edu, deo@ag.arizona.edu, dettman@geo.arizona.edu, dgw@ag.arizona.edu, djyoung@ag.arizona.edu, dmeko@ltrr.arizona.edu, dweiner@u.arizona.edu, eglenn@ag.arizona.edu, ekwurz@hwr.arizona.edu, eschlager@bpa.arizona.edu, finan@u.arizona.edu, frisvold@ag.arizona.edu, ganapol@cowboy.ame.arizona.edu, garych@casa.arizona.edu, giampapa@noao.edu, glennon@law.arizona.edu, grm@ag.arizona.edu, gwoodard@ag.arizona.edu, hadleyd@u.arizona.edu, hagedorn@ag.arizona.edu, hahmann@atmo.arizona.edu, herman@atmo.arizona.edu, hoshin@hwr.arizona.edu, huxman@email.arizona.edu, ipepper@ag.arizona.edu, jartiola@ag.arizona.edu, jcole@geo.arizona.edu, jedes@ag.arizona.edu, jesharkey@compuserve.com, jlansing@u.arizona.edu, jlbetanc@usgs.gov, jlee@cmi.arizona.edu, jlunine@lpl.arizona.edu, jmonk@email.arizona.edu, jquade@geo.arizona.edu, jtabor@ag.arizona.edu, jto@u.arizona.edu, jull@u.arizona.edu, jvaldes@u.arizona.edu, jwash@hwr.arizona.edu, kajordan@ag.arizona.edu, katie@ltrr.arizona.edu, kevfitz@ag.arizona.edu, kflessa@u.arizona.edu, kfoster@ag.arizona.edu, krider@atmo.arizona.edu, kring@lpl.arizona.edu, kupfer@u.arizona.edu, kursinski@atmo.arizona.edu, kurt.thome@optics.arizona.edu, larson@ag.arizona.edu, lauretta@lpl.arizona.edu, lemos@u.arizona.edu, lfshubit@u.arizona.edu, lgay@ag.arizona.edu, liverman@u.arizona.edu, lon@lpl.arizona.edu, lsp@u.arizona.edu, marek@hwr.arizona.edu, martha@hwr.arizona.edu, marvinw@u.arizona.edu, maryk@hrp.arizona.edu, matthias@ag.arizona.edu, mbegay@u.arizona.edu, mcclaran@u.arizona.edu, mcewen@pirl.lpl.arizona.edu, merideth@u.arizona.edu, mevans@ltrr.arizona.edu, mhickman@enr.arizona.edu, mhughes@ltrr.arizona.edu, mittal@math.arizona.edu, mlivings@u.arizona.edu, moran@tucson.ars.ag.gov, morehoub@u.arizona.edu, mpoulton@u.arizona.edu, mullen@atmo.arizona.edu, mwitten@peds.arizona.edu, myoklic@ag.arizona.edu, nampel@u.arizona.edu, nunamaker@bpa.arizona.edu, olsenj@u.arizona.edu, orbachmj@ag.arizona.edu, palynolo@geo.arizona.edu, parrish@geo.arizona.edu, pelletier@geo.arizona.edu, phil@nexus.snr.arizona.edu, pitu@sie.arizona.edu, polt@u.arizona.edu, ram@bpa.arizona.edu, renno@atmo.arizona.edu, rhwebb@usgs.gov, rjfrye@u.arizona.edu, rmedlin@u.arizona.edu, robichau@u.arizona.edu, robmacc@ag.arizona.edu, roger@hwr.arizona.edu, rvarady@u.arizona.edu, scarab@u.arizona.edu, schmidtz@u.arizona.edu, schowengerdt@ece.arizona.edu, scornell@u.arizona.edu, sen@sie.arizona.edu, sheppard@ltrr.arizona.edu, shuttle@hwr.arizona.edu, silver@ag.arizona.edu, simonw@enr.arizona.edu, sleavitt@u.arizona.edu, smarsh@ag.arizona.edu, soroosh@hwr.arizona.edu, spherule@u.arizona.edu, steidl@ag.arizona.edu, tdaniel@u.arizona.edu, tes@u.arizona.edu, thompson@ag.arizona.edu, tswetnam@ltrr.arizona.edu, vierling@u.arizona.edu, vlopes@ag.arizona.edu, wbeck@physics.arizona.edu, wendt@u.arizona.edu, wierenga@ag.arizona.edu, willott@u.arizona.edu, wsprigg@u.arizona.edu, xubin@atmo.arizona.edu, yool@skydog.geog.arizona.edu

The Brazilian congress is now voting on a project that will reduce the Amazon forest to 50% of its size. It will take 1 MINUTE to read this, but PLEASE put your names on the list and forward this on.

The area to be deforested is 4 times the size of Portugal and would be mainly used for agriculture and pastures for livestock. All the wood is to be sold to international markets in the form of wood chips, by large multinational companies. The truth is that the soil in the Amazon forest is useless without the forest itself. Its quality is very acidic and the region is prone to constant floods.

At this time more than 160,000 square kilometres deforested with the same purpose are abandoned and in the process of becoming deserts. Deforestation and the subsequent processing of the woodchips on this scale will also release huge amounts of carbon, which is currently locked up in the wood, back into the atmosphere worsening the problem of climate change.

We just cannot let this happen.

Please copy the text into a 'new email',

put your complete name in the list

below and send to everyone you know.

DON'T JUST FORWARD IT THOUGH AS IT WILL

THEN END UP WITH ROWS AND ROWS of >'s.

If you are the 500th person to sign please send a

copy to:

fsaviolo@openlink.com.br

Thank you for your help

01 - Fernanda de Souza Saviolo - Rio de Janeiro -

RJ

02 - Nara Maria de Souza - Rio de Janeiro - RJ -

03 - Julio Cesar Fraga Viana - Rio de Janeiro -

RJ-

04 - Monica Grotkowsky Brotto -Sao Paulo - SP -

05 - Mauricio Grotkowsky Brotto - Sao Paulo -

06 - Ricardo A.Corrallo - SP

07 - Sunny Jonath! an - SP

08 - Leonardo Larsen Rocha - SP

09 - Evandro Sestrem -

10 - Marco Aurlio Wehrmeister - Blumenau - SP

11 - Angela Maria Gonalves - Blumenau -SP

12 - Alessandra Bernardino- Blumenau - SP

13 - Pedro Carstens Penfold - Rio de Janeiro - RJ

14 - Annelena Porto Delgado - S\*o Paulo -

15 - Erica Couto -S\*o Paulo -

16 - Elaine Couto- S\*o Paulo - SP

17 - Tatiana de Almeida Voivodic - S\*o Paulo

18 - Solange B Furlanetto - S\*o Paulo / SP

19 - Marcos deSouza Mello - S\*o Paulo / SP

20 - Eliane Santiago - S\*o Paulo/ SP

21 - Francisca J. Bezerra Alves Ara\*jo - S\*o Paulo /SP

22 - Carlos Alberto Dantas Junior - Rio de Janeiro /RJ

23 - Daniel Rodrigues da Cruz - Rio de Janeiro / RJ

24 - Gabriella Gaida - Rio de Janeiro - RJ

25 - Ceclia Silva Teixeira Pinto - RJ - 03/06/75

26 - Tania Santos Miguel

27 - Celso Henrique Diniz Valente de Figueiredo -RJ

28 - Marcelo Lopes Rheingantz - Rio de Janeiro - RJ

29 - Rodrigo Tassarini de Oliveira - Rio de Janeiro - RJ

30 - Andr Lobato Pinheiro - Rio de Janeiro - RJ

31 - Ismael dos Santos Silva - RJ -

32 - Gustavo Alexandre Caetano Correa - RJ -

33 - Juana Varella Barca de Amorim - Rio de Janeiro  
34 - Nara Faria Silva Rio de Janeiro -RJ-  
35 - Isabella Jaggi S\*oPaulo- SP -  
36 - Diana de Andrade Freitas - Rio de Janeiro -RJ  
37 - Karina Dourado - S\*o Paulo -  
38 - Pablo Genuncio Garcia - Rio de Janeiro -  
39 - Fabola Morais de Lucca - S\*o Paulo -  
40 - Alexei Morais de Lucca - S\*o Paulo - SP -  
41 - Renata Regina Roxo - S\*o Paulo - SP -  
42 - Fernanda Teixeira - S\*o Paulo - SP -  
43 - Patricia Freitas - S\*o Paulo - SP  
44 - Cintia Regina K\*rnner -Alemanha - DE -  
45 - Wolfgang K\*rnner - Alemanha - DE  
46 - Roseani Vieira Rocha - San Francisco - CA  
47 - Angela Ichimura - S\*o Paulo - SP  
48 - Assunta Viola - Sao Paulo - SP  
50 - Marina Amaral - Alemanha - DE  
51 - Fabian Rodrigues Caetano - Sao Paulo - SP -  
52 - Luciana Cabrera- Santa Barbara- Ca  
53 - Andrea Torres- Lahaina, Hawaii  
54 - Carla Duarte- New York, NY  
55 - Sergio Goes - New York, NY  
56 - Itaal Shur - New York, NY  
57 - Hiroyoku Sanada-New York, NY, US  
58 - Marianne Ebert-new york, NY, US  
59 - Gloriana M. Calhoun - New York, NY  
60 - Roger Jazilek - New York, NY  
61 - Cheryl To - New York, NY  
62 - Judy Mercer - Paris, France  
63 - Evelyne Pouget- Woodstock, NY  
64 - Hera-Woodstock, NY  
65 - Nicos Peonides - Cyprus - New York NY  
66 - Fiona Cousins - New York, NY  
67 - Alistair Millington - London, UK  
68 - Edgar Craggs - Bristol, UK  
69 - Chris Hastie - Nottingham, UK  
70 - Adam Barley - Bristol, UK  
71 - Dawn Morgan - Bristol, UK  
72 - Lottie Berthoud - Bristol, UK  
73 - Julia Simnett - Bristol, UK  
74 - Lindsey Colbourne - Bath, UK  
75 - Wendy Lawton - Bath, UK  
76 - James Friel - Birmingham, UK  
77 - Sylvia Magyar - Budapest, Hungary  
78 - Danco Uzunov - Bu! dapest Hungary  
79 - Vladimir Jurukovski - New York, USA  
80 - Laste Stojanovski - Auckland, New Zealand  
81 - Katerina Rusevska - Skopje, Macedonia  
82 - Snezana Pesic -Kragujevac, Yugoslavia  
83 - Sladjan Pavlovic - Beograd, Yugoslavia  
84 - Jelka Crnobrnja-Isailovic - Belgrade, Yugoslavia  
85 - Begoqa Arano-Brussels, Belgium  
86 - Brendan Kelly-Brussels, Belgium  
87 - Rafael Marquez-Madrid, Spain

88 - Ignacio De la Riva-Madrid, Spain  
89 - A. Townsend Peterson - Lawrence, Kansas  
90 - Anita Gamauf-Vienna, Austria  
91 - Desmond Allen-Tokyo, Japan  
92 - Krys Kazmierczak, London, UK.  
93 - Anand Prasad, Denmark  
94 - Pauline McLeod, York, UK  
95 - Lee Casey, Harrogate, United Kingdom  
96 - Sibylle Rhovier, Bournemouth, UK  
97 - Peter McCaig, London UK  
98 - Robert Vint, Totnes, UK  
99 - Hugh Warwick, Oxford, UK  
100 - Richard Madden, Brighton, UK  
101 - Amanda Marks, Woodbridge, UK  
102 - Jane Laws, Woodbridge, UK  
103 - Joanna Hayes, London, UK  
104 - Julian Matthews - London UK  
105 - Anna Davies, London, UK  
106 - Darren Lucas, Mansfield, UK  
107 - Nic Masters, Taunton, UK  
108 - Kate Dougal, London, UK  
109 - Richard Dolan, London, UK  
110 - Stacey Watson, London, UK  
111 - Shannon O'Brien, London, UK  
112 - Jigna Patel, London, UK  
113 - Lisa O'Brien, Malmo, Sweden  
114 - Johan Luyckx, Malmo, Sweden  
115 - John Dolecek, Malmo, Sweden  
116 - Steven Huynh, Malmo, Sweden  
117 - Bodil Johansson, Malmo, Sweden  
118 - Anna-Maj Wandt, Dalby, Sweden  
119 - Kajsa Nordstrom, Uppsala, Sweden  
120 - Anna Hillerberg, Stockholm, Sweden  
121 - Annika Jegbert, Stockholm, Sweden  
122 - Christer Jegbert, Stockholm, Sweden  
123 - Anna-Carin Collin, Taby, Sweden  
124 - Nadja von Kantzow, Stockholm, Sweden  
125 - Johan von Kantzow, Stockholm, Sweden  
126 - Calle Rosengren, Stockholm, Sweden  
127 - Daniel Achilles, Stockholm, Sweden  
128 - Cecilia Andersson, Stockholm, Sweden  
129 - Henrik Eriksson, Stockholm, Sweden  
130 - Pontus Holmgren, Stockholm, Sweden  
131 - J.B. Russell, Paris, France  
132 - S.D. Smith, Virginia, United States  
135 - January Harris, Virginia, United States  
136 - Tarki L. - Crook, Virginia, United States  
137 - Marcia L. Rutledge, Syracuse, NY, USA  
138 - Justin A. Cohen, Syracuse, NY, US  
139 - Stephen C. Shriber, Amsterdam, The Netherlands  
140 - Laura I. Shriber, Den Haag, The Netherlands  
141 - Rutje V. Gorissen, Amsterdam, The Netherlands  
142 - Floris Mansvelt Beck  
143 - Herbert A. Hauer

144 - A. Onno J. Verkuyl, Amsterdam The Netherlands  
145 - Femke van der Horst - Amsterdam, netherlands  
145 - R. van der Horst, Amsterdam, The Netherlands  
147 - R. Frankfort, Amsterdam, The Netherlands  
148 - J. van Donselaar, Leusden, The Netherlands  
149 - W.T.H.M.Halewijn, Amersfoort, The Netherlands  
150 - A.F.P. van den Donk  
151 - Kai Schneider, Denmark.  
152 - Thomas! Jensen, Denmark  
153 - Peter Juul Noer, Denmark  
154 - Ken Nygaard Jensen, Denmark  
155 - Magnus Wiberg, Sweden  
156 - Alex Belknap, USA  
157 - Bonnie North, USA  
158 - Baraka Lawrence USA  
159 - Peggy Atwood, USA  
160 - Susan Epstein, USA  
161 - Kristine Fiones, Bearsville, NY USA  
162 - Philip Perlman, Kerhonkson, NY USA  
163 - Zara Shulman, Fukui, Japan  
164 - Emily Kodama, Fukui, Japan  
165 - Beth Reid, Boston, USA  
166 - Lisa Petras, Boston, USA  
167 - Carrie A. Flemming, Berkeley, USA  
168 - Steve Keightley, Oakland CA, USA  
169 - Abigail Lewis, San Francisco, CA USA  
170 - rEVEREND bILL bLITZ, sAN fRANCISCO cA usa  
177 - Monica Senter, San Francisco, Ca  
178 - Spoonbender, Sanfrancisco, Ca  
179 - Tena Moore, San Francisco, CA  
180 - War Dragon, Wayne, WV  
181 - Love Light, Wayne, WV  
182 - Amber Pompeo, FL  
183 - Lisette Titre, Fl  
184 - Deborah Titre, FL, USA  
185 - Erin Wiswall, NH, USA  
186 - Alyssa Wonkka NH! , USA  
187 - Hege Ravdal, KY, USA  
188 - Maria Cattell, Va, USA  
189 - Kevin Ernst, CA, USA  
190 - Jane Anderson, CA, USA  
191 - Wendy MacLeod, Los Gatos, CA, USA  
192 - Christian Iversen, Copenhagen, Denmark  
193 - Karen Leth Hansen, Copenhagen, Denmark  
194 - Anders Holtegaard, Copenhagen Denmark  
195 - Mikkel Drucker, Copenhagen, DK  
196 - Ole van Hauen-Drucker, Malaga,Spain  
197 - Suzette van Hauen-Drucker, Malaga, Spain  
198 - Jane Elizabeth Gould, Marbella, Spain  
199 - Bridget Gregory UK  
200 - Barney Cue UK  
201 - David Wilson, Jakarta, INDONESIA  
202 - Chris Little, Louisiana, USA  
203 - Jon Campbell , Louisiana, USA

204 - Chris Pereira, Long Beach, USA  
205 - Suzanne Nezin - Lake Forest, USA  
206 - Andrea Ramey-Manhattan Beach, CA USA  
207 - Marilyn Mercer - Palm Desert, CA USA  
208 - Christine Bjerke-Santa Monica, CA USA  
209 - Pamela Lillig James - Burbank, CA, USA  
210 - Keli M. Rogers, Sherman Oaks, CA, USA  
211 - Kevin R. Davis, Los Angeles, CA USA  
212 - James E. Swanson, Los Angeles, Ca USA  
213 - Alexandra Young, Beverly Hills, CA USA  
214 - Rebecca K. Young, Valdosta, GA USA  
215 - Kimberly L. Novak, Yokohama, Japan  
216 - Kathleen Pope Bingaman, Lilburn, USA  
217 - Meg S, Atlanta, GA, USA  
218 - Eva Bozeman, Atlanta, GA, USA  
219 - Debbie Pellett, Lewes, Sx., UK  
220 - Madeleine Pellett, Lewes, Sx, UK  
221 - Chris Stanley, Lichfield, Staffordshire, UK  
222 - Jules Cadie, Burntwood, Staffs, UK  
223 - Kully Thiarai, Bradford UK  
224 - David Brown, Bradford UK  
225 - Sally Abbott, Manchester UK  
226 - Michael Burns, Manchester UK  
227 - George Ormond, London, UK  
228 - Steven Dykes, London, UK  
229 - Louisa Ashley, Leeds UK  
230 - Clare Duffy, Leeds, UK  
231 - Anna Dunwoodie, Edinburgh, UK  
232 - Daniel Sansome, Madrid, Espana  
233 - Rebecca Plunkett, Edinburgh, Scotland  
234 - Zoe Kemp, Argyll, Scotland  
235 - Graeme Franklyn, Edinburgh, Scotland  
236 - James Lambie, Masterton, New Zealand  
237 - Steve Veix, Masterton, New Zealand  
238 - Kylie Jensen, Palmerston North, New Zealand  
239 - Abigail Allan, Palmerston North, New Zealand  
240 - Anna Brooking, Palmerston North, New Zealand  
241 - Caragh Briggs, Palmerston North, NZ  
242 - Carol Smith, Bay of Islands, NZ  
243 - Steven McKenzie, Waitakere, New Zealand  
244 - Dayne Maxwell, NZ  
245 - Bronwyn Buckle, Reno, NV  
246 - Coral Foster, Devonport, Auckland, New Zealand  
247 - Sarah Gibbs, Northcote, New Zealand  
248 - Eugenie Sage, Christchurch, New Zealand  
250 - Bob Leonard, Christchurch, New Zealand  
251 - Brian Eno, London, Britain  
252 - Cally, East Anglia, UK, (with beautiful trees)  
253 - Matt Johnson, New York, USA (with beautiful skyscrapers)  
254 - James Eller, UK  
255 - gretch eller, uk  
256 - Mike Lipscombe, Malibu, Los Angeles, USA  
257 - STEVE CHIVERS, LONDON, ENGLAND.  
258 - Sophie muller, London, England.

259 - Matthew Weir, Nijar, Almeria, Spain.  
260 - Gus Cairns, London N4, UK  
261 - Jo Fenech, London, EC1 UK  
262 - Mira King, London, W6ONG  
263 - Ravinder Chahal, London W9, UK  
264 - Ilja Maynard-Gregory, London, UK  
265 - Barbara Skubic, Ljubljana, Slovenia  
266 - Jozef Roskar, Ljubljana, Slovenia  
267 - Milan Orozen Adamic, Ljubljana, Slovenia  
268 - Andreja Orozen Adamic, Ljubljana, Slovenija  
269 - Lovro Stanovnik, Ljubljana, Slovenia  
270 - Katarina Petra Stanovnik, Ljubljana, Slovenia  
271 - Tomaz Stanovnik, Ljubljana, Slovenia  
272 - Tatjana Irman Florjanc  
273 - Vojka Sircelj, Ljubljana, Slovenia  
274 - Ana Tretjak, Slovenia  
275 - Danijela Sabic, Slovenia  
276 - Willibald Croi, Luxembourg  
277 - Daniel Rase, Luxembourg  
278 - Marie-France Haupt, Germany  
279 - Minh-Chau Nguyen, Luxembourg  
280 - Wolfgang Buss, Germany  
281 - Felix Maria Woschek, Portugal  
282 - Frank Wieland, Germany  
283 - Michel VAN! WASSENHOVEN, Belgium  
284 - Tinus Smits The Netherlands  
285 - Suriya Osman, Malaysia  
286 - Simon King, Norfolk UK  
287 - David Jeans, Norfolk UK  
288 - Ingegard Mansson, Sweden  
289 - Zainab Hujjat, Sweden  
290 - Aboud Hujjat, Sweden  
291 - Elaine Sharkey, UK  
292 - Keith Davies  
293 - Caroline Whitehouse, UK  
294 - Peter Gasiorowski, Birmingham, UK  
295 - Kevin McGoldrick Guernsey Channel Islands  
296 - Jon Barrett, Guernsey, Channel Islands  
297 - Russell Clark, Guernsey, Channel Islands  
298 - Nicole Howard, Sydney Australia  
299 - Patricia Swan, Sydney Australia  
300 - Riley Edwards, Sydney Australia  
301 - Louisa Doran Edmunds, Sydney Australia  
302 - Ana Bratkovic, Sydney, Australia  
303 - Christine mueller, Sydney, Australia  
304 - Annette Williams, Wollongong, Australia  
305 - Jill Merrin, Wollongong, Australia  
306 - Margaret O'Riordan, Bulli Australia  
307 - Jennifer Diamond, Smithfield NSW Australia  
308 - Carol! yn Diamond, Dulwich Hill, NSW Australia  
309 - Nigel Abbott, Darlinghurst, NSW Australia  
310 - Sam Abbott, Kingswood, SA Australia  
311 - Michael Dadds, Adelaide SA Australia  
312 - Brendan Harradine, Adelaide SA Australia

313 - Jacquie van der Linde, Amata Community, Australia  
314 - Zaid Farran, Adelaide SA Australia  
315 - Cherice Ogilvie, Adelaide, SA, Australia  
316 - Tiffany Newman, Adelaide, SA, Australia  
317 - Paul Suleyman, Adelaide, SA, Australia  
318 - Lin Young, Adelaide, S. Australia.  
319 - Annie May, Lampeter, Wales  
320 - Eleanor Dolan, Cambridge, UK  
321 - Mike Dolan, Cambridge, UK  
321 - Phil Dolan, Tasmania, OZ  
322 - David Carrington, Cheddington, UK  
323 - Kevin Wilkinson, Barnet, UK  
324 - Michael Walsh, UK & IRL  
325 - Sharon Foster, London, UK  
326 - Tony Clark, Lympstone, UK  
327 - Michael Millea, New York, US  
328 - Don Campbell, New York, USA  
329 - Doug Stoker, Lincoln, UK  
330 - Ann Stoker, Lincoln, UK  
331 - Jim Curry, Manchester, UK  
332 - Ben Christie, London, UK  
333 - Sophia Christie, Birmingham, UK  
334 - Pete Ritchie, Edinburgh, UK  
335 - Ninian Stuart, Fife, UK  
336 - Catherine Lloyd, Perthshire, UK  
337 - Tom Gray, Glenrothes, Scotland  
328 - Biddy Gray, Glenrothes, Scotland  
329 - Alasdair Gray, Edinburgh, Scotland  
330 - David Gray, Macclesfield, UK  
331 - Donald Allan, Aberdeen, Scotland  
332 - Jo Mein, Edinburgh, Scotland  
333 - Rond Salter, Aberdeen, Scotland  
334 - Diana Firth, Glasgow, Scotland  
335 - Tamara Van Strijthem, Edinburgh, UK  
336 - Julie Nayer, Bruxelles, Belgique  
337 - Andre Nayer, Bruxelles, Belgique  
338 - Philippe Vincke, Brussels, Belgium  
339 - Denis Dresse, Brussels, Belgium  
340 - Joel Dresse, Port-au-Prince, Haiti  
341 - Robert Nadal, Port-au-Prince, Haiti  
342 - Meissonnier Martin, Paris  
343 - Yannick Jame, Lisboa, Portugal  
344 - Yves Chbtellier, Rennes - France  
345 - Kusum & mp; Savaad Wells -Australia  
346 - Anitra Nelson, Brunswick, Victoria, Australia  
347 - Frans Timmerman, Melbourne Australia  
348 - Peter Harley, Melbourne, Australia  
349 - Simon Sliker, Melbourne, Australia  
350 - Christopher Coe, Melbourne, Australia  
351 - Innes Park, Glasgow, Scotland  
352 - Zssfia Holluby, Budapest, Hungary  
353 - Stefanie Pietsch, Berlin, Germany  
354 - Linda Schlosser, Berlin, Germany  
355 - Annegret Buttgerit, Berlin, Germany

356 - Katrin Robeck, Berlin, Germany  
357 - Jurica Volarevic, Moscow, Russia  
358 - Christian Altfuldisch, Berlin, Germany  
359 - Michaela Hausen, Berlin, Germany  
360 - Boris Marrone, Leuven, Belgium  
361 - Kristof Vanisterbecq, Belgium  
362 - Ann Janssens, Belgium  
363 - Judith Elseviers, Belgium  
364 - Thomas De Prins  
365 - Jelle Van Riet  
366 - Roevens Iris  
367 - Bart Prinsen  
368 - Leunis Veerle, Antwerpen, Belgium.  
369 - David Kennedy, Antwerpen, Belgium.  
370 - Andreлина Freil tas Ribeiro de Almeida, Antwerpen, Belgium.  
371 - Guy herijgers, Antwerpen, Belgium  
372 - Stefano Cirillo, Napoli, Italy  
373 - Sally Gauci, Melbourne, Australia  
374 - Candida Spender-van Rood,  
375 - Peta van Rood, Adelaide, Australia  
376 - Stephanie Britton, Adelaide, Australia  
377 - Robert Crocker, Adelaide, Australia  
378 - Anna Brown, Milano, Italy  
379 - Marco Saibene, Milano, Italy  
380 - Julian Elliott, Australia  
381 - Nicole Allard, Australia  
382 - Josh Davis, Newcastle, Australia  
383 - John Ferguson, Newcastle, Australia  
384 - Susan Ferguson, Newcastle, Australia  
385 - Adrian Figgess, Altrincham, UK  
386 - Alison Figgess, Altrincham, UK  
387 - Anne Cheeseman, Whalley UK  
388 - Christopher Cheeseman, Whalley UK  
389 - Linda Ca tlow, Burnley, UK  
390 - Jill Willett, Coalville, UK  
391 - K Lewis Northumberland UK  
392 - Elaine Ryder, Northumberland UK  
393 - Lyn Dodds, Tyne and Wear UK  
394 - Emma Cresswell, Tyne and Wear, UK  
395 - Farzana Khan, Dubai, UAE  
396 - Emma Wheeler, Dubai, UAE  
397 - Sami Razek, Muscat, Oman  
398 - Faisal Riami, Muscat Oman  
399 - Claire Henshaw, Derby, UK  
400 - Iain Henshaw Knutsford, UK  
401 - Tim Muir Camberley UK  
402 - Angela Collins Reigate UK  
403 - Geoff Wakefield  
404 - Abigail Jameson  
405 - Mark Brattle - London - UK  
406 - Libby Kennedy - UK  
407 - Helen Brown - UK  
408 - Olivia Alder-UK  
409 - Alexa Smith-UK

410 - Lucy Hudson - UK  
411 - Rob Maguire - UK  
412 - Jo Clarke - UK  
413 - Nam Kanderian - UK  
414 - Martin Deakin - UK/DE  
415 - Jan Ridderhof, Rotterdam, The Netherlands  
416 - Bert van Gruijthuijsen, The Netherlands  
417 - Mike Richards - UK  
418 - Nicola Richards - London -UK  
419 - Russell Needham, Milverton, Somerset UK  
420 - Susie Needham, Milverton, Somerset UK  
421 - Arthur Needham, Milverton, Somerset UK  
422 - Jodi Warrick, Milverton, Somerset UK  
423 - Jane Procter, Taunton, Somerset UK  
424 - Harry Procter, Taunton, Somerset UK  
425 - John Procter, London, UK  
426 Priyanka Kanse, London, UK  
427 - Tansy Huws, UK  
428 - Ursula Huws, UK  
429 - Colin Leys, UK  
430 - Margaret Hughes, Ontario, Canada  
431 - Gerard Wyatt, Kingston, Ontario, Canada  
432 - Peter Hodson, Canada  
433 - Dolf Harmsen, Glenburnie, Canada  
434 - Bristol Foster, Saltspring Island, Canada  
435 - T. E. Reimchen, Victoria, British Columbia, Canada  
436 - Philip Clement, Victoria, British Columbia, Canada  
437 - Scott Garvin, Calgary, Alberta, Canada  
438 - Amy Gibson, Calgary, Alberta, Canada  
439 - Lisa Hebden, Halifax, Nova Scotia, Canada  
440 - Andreas Eschment, Germany  
441 - Sebastian Graetz, Germany  
442 - Theo Keating, London, UK  
443 - Sarah McManus, London, UK  
444 - Amanda Constance, London, UK  
445 - Plum Brackenbury, London, UK  
446 - Georgie Docker, London, UK  
447 - Naomi Browne, London, UK  
448 - Phillippa Ward, London UK  
449 - Eddie Brandstatter, London UK  
450 - Johann Trojer, Innsbruck Austria  
451 - Claudia Trojer, Innsbruck Austria  
452 - Bernard Millen, Volders, Austria  
453 - Karin Millen, Volders, Austria  
454 - Thomas Millen, Volders, Austria  
455 - Nora Millen, Volders, Austria  
466 - Christoph SpÄ¶tl, Kolsassberg, Austria  
467 - Christina SpÄ¶tl, Kolsassberg, Austria  
468 - Silvia Frisia, Trento, Italy,  
469 - Andrea Borsato, Trento, Italy  
470 - Marco Cantonati, Trento, Italy  
471 - Eugen Rott, Innsbruck, Austria  
472 - Herman van Dam, Wijk bij Duurstede, The Netherlands  
473 - Bas van Geel, Amsterdam, The Netherlands  
474 - Brian Huntley, Durham, United Kingdom

475 - Jonathan Overpeck, Tucson, United States

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Jonathan T. Overpeck  
Director, Institute for the Study of Planet Earth  
Professor, Department of Geosciences

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fax: +1 520 792-8795  
[http://www.geo.arizona.edu/Faculty\\_Pages/Overpeck.J.html](http://www.geo.arizona.edu/Faculty_Pages/Overpeck.J.html) <http://www.ispe.arizona.edu/>

Subject: reconstruction  
From: "Michael E. Mann" <[mann@virginia.edu](mailto:mann@virginia.edu)>  
Date: 9/16/02 8:28 AM  
To: [paleo@noaa.gov](mailto:paleo@noaa.gov)  
CC: [rbradley@geo.umass.edu](mailto:rbradley@geo.umass.edu), [mhughes@ltrr.arizona.edu](mailto:mhughes@ltrr.arizona.edu), [srutherford@virginia.edu](mailto:srutherford@virginia.edu), [Mark.Eakin@noaa.gov](mailto:Mark.Eakin@noaa.gov),  
[mann@virginia.edu](mailto:mann@virginia.edu)

Dear folks:

I've noted a number of significant omissions from the NOAA Paleo website that I wanted to bring to your attention.

In your "circulation" reconstruction section of this webpage:

<http://www.ngdc.noaa.gov/paleo/recons.html>

the Mann et al cold-season Nino3 reconstruction should be included. It is available here:

[http://www.ngdc.noaa.gov/paleo/ei/ei\\_data/ninocold-recon.dat](http://www.ngdc.noaa.gov/paleo/ei/ei_data/ninocold-recon.dat)

Also, there are a number of recently published papers (based on NOAA-funded projections) which ought to be listed on the NOAA website (<http://www.ngdc.noaa.gov/paleo/whatsnew.html>)

They are (titles and hyperlinks to pdf reprints provided):

Mann, M.E. Climate During the Past Millennium, *Weather*, 56, 91-101, 2001.

Shindell, D.T., Schmidt, G.A., Mann, M.E., Rind, D., Waple, A., Solar forcing of regional climate change during the Maunder Minimum, *Science*, 7, 2149-2152, 2001.

Mann, M.E., Bradley, R.S., Briffa, K.R., Cole, J., Hughes, M.K., Jones, J.M., Overpeck, J.T., von Storch, H., Wanner, H., Weber, S.L., Widmann, M., Reconstructing the Climate of the Late Holocene, *Eos*, 82, 553, 2001.

Waple, A., Mann, M.E., Bradley, R.S., Long-term Patterns of Solar Irradiance Forcing in Model Experiments and Proxy-based Surface Temperature Reconstructions, *Climate Dynamics*, 18, 563-578, 2002.

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Mann, M.E. , The Value of Multiple Proxies, Science, 297, 1481-1482, 2002.

Mann, M.E., Rutherford, S., Climate Reconstruction Using 'Pseudoproxies', Geophysical Research Letters, 29, 1391-1-1391-4, 2002.

Thanks in advance for taking note of these omissions.

Best regards,

Mike Mann

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Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

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e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: RE: New ESH AO

From: "Verardo, David J." <dverardo@nsf.gov>

Date: 10/25/02 10:59 AM

To: "Matt Duvall" <mduvall@bates.edu>, ackermanr@wsu.edu, acrowell@alaska.net, Al Werner <awerner@mhc.mtholyoke.edu>, alexander.wolfe@ualberta.ca, Amanda Lynch <manda@cires.colorado.edu>, ammann@ucar.edu, "Anne E. Jennings" <jenninga@spot.colorado.edu>, apy052\_rufus@yahoo.com, awerner@mhc.mtholyoke.edu, axford@nsidc.org, barber@ims.alaska.edu, bartlein@oregon.uoregon.edu, Bette Otto-Bliesner <ottobli@ncar.ucar.edu>, Beverly Johnson <bjohnso3@bates.edu>, bgervais@ucla.edu, brian.huntley@durham.ac.uk, brook@vancouver.wsu.edu, Bruce Finney <finney@ims.alaska.edu>, clark@skio.peachnet.edu, clarkp@ucs.orst.edu, Darrell.Kaufman@nau.edu, david.lubinski@colorado.edu, ddarby@odu.edu, dean@ims.uaf.edu, dengstrom@smm.org, Devendra Lal <dlal@ucsd.edu>, dfrancis@geo.umass.edu, dhardy@climate1.geo.umass.edu, dichtl@kryos.colorado.edu, dmann@mosquitonet.com, dmccorkle@whoi.edu, doner@spot.colorado.edu, drm7@midway.uchicago.edu, druid@lamont.ldeo.columbia.edu, druidrd@ldeo.columbia.edu, dstone@gi.alaska.edu, "Verardo, David J." <dverardo@nsf.gov>, dyurg@tintin.colorado.edu, eito@umn.edu, ekarab@geol.sc.edu, elevac@tiger.lsu.edu, Eric Steig <steig@u.washington.edu>, Feng-Sheng Hu <fshu@life.uiuc.edu>, ffjeb1@uaf.edu, ffldh@uaf.edu, ffmsm@uaf.edu, ffnhb@uaf.edu, ffver@uaf.edu, finney@ims.alaska.edu, forester@usgs.gov, fortierdaniel@msn.com, francus@geo.umass.edu, fyuan@atmos.albany.edu, g.brass@arctic.gov, gcb@ldeo.columbia.edu, "Glen M. MacDonald" <macdonal@geog.sscnet.ucla.edu>, "Glenn W. Berger" <gwberger@maxey.dri.edu>, glgparkr@ubvms.cc.buffalo.edu, gmiller@colorado.edu, Greg Zielinski <gzielinski@maine.edu>, grimm@museum.state.il.us, hallet@u.washington.edu, harders@vancouver.wsu.edu, hrowe@uky.edu, "James C. White" <james.white@colorado.edu>, James Syvitski <syvitski@colorado.edu>, jason.briner@colorado.edu, "Jeffrey P. Severinghaus" <jseveringhaus@ucsd.edu>, jek@facstaff.wisc.edu, jenninga@spot.colorado.edu, jerrybrown@igc.org, jkruse@geo.umass.edu, jmcmanus@whoi.edu, John Andrews <andrewsj@spot.colorado.edu>, "Jonathan T. Overpeck" <jto@u.arizona.edu>, Joseph.Stoner@colorado.edu, juliebg@geo.umass.edu, kaplanm@geology.wisc.edu, Konrad Hughen <khughen@whoi.edu>, land@geo.umass.edu, Larry.Coats@nau.edu, lbu@u.washington.edu, "Lloyd D. Keigwin" <lkeigwin@whoi.edu>, lloyd@middlebury.edu, lmarin@best.com, Lonnie Thompson <thompson.3@osu.edu>, lyn4@u.washington.edu, mabbott1@pitt.edu, Malcolm Hughes <mhughes@ltrr.arizona.edu>, Marianne Douglas <msvd@opal.geology.utoronto.ca>, Mark Twickler

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<mst@gust.sr.unh.edu>, mary.edwards@svt.ntnu.no, Mathieu Duvall <matt@consulair.com>, "Michael J. Retelle" <mretelle@bates.edu>, mk11@umail.umd.edu, MockCJ@gwm.sc.edu, mode@uwosh.edu, mretelle@bates.edu, mst@gust.sr.unh.edu, "Nancy H. Bigelow" <ffnhb@uaf.edu>, nplasca@uwm.edu, "Swanberg, Neil R." <nswanber@nsf.gov>, oches@chumal.cas.usf.edu, ottobli@ncar.ucar.edu, "P. Thompson Davis" <pdavis@bentley.edu>, "Parker E. Calkin" <glgparkr@ubvms.cc.buffalo.edu>, pata@u.washington.edu, patridge@geo.umass.edu, "Paul A. Mayewski" <paul.mayewski@maine.edu>, Paul Quay <pdquay@u.washington.edu>, Peter Sauer <pesauer@indiana.edu>, "Peter U. Clark" <clarkp@ucs.orst.edu>, porinchu@ucla.edu, rabryson@wisc.edu, "Raymond S. Bradley" <rbradley@geo.umass.edu>, rick.forster@geog.utah.edu, "Rosanne D'Arrigo" <druidrd@ldeo.columbia.edu>, Scott Elias <saelias@colorado.edu>, Scott Lehman <lehmans@colorado.edu>, scott.anderson@nau.edu, slf@uic.edu, sowers@geosc.psu.edu, stagerj@paulsmiths.edu, steig@u.washington.edu, steve@ucar.edu, tabrown@llnl.gov, "Pyle, Thomas E." <tpyle@nsf.gov>, warnick@arcus.org, Wendy Eisner <wendy.eisner@uc.edu>, William Mode <mode@vaxa.cis.uwosh.edu>, William.Manley@colorado.edu, williams@nceas.ucsb.edu, woswald@u.washington.edu, wwatts@tcd.ie, y.deng@auckland.ac.nz, ziy2@lehigh.edu

Dear Friends,

Just a note of clarification to Matt's message. In fiscal year 2003, the ESH deadline is January 15, 2003. Beginning in fiscal year 2004 (and for each year thereafter), the ESH competition will be held in October at the beginning of the fiscal year. There will only be one competition deadline for ESH each year. Although the new ESH AO shows 2 dates, you have to remember that Oct 15 is a new fiscal year for the US government.

Best of luck,

Dave

David J. Verardo

Director, Paleoclimate Program

National Science Foundation

GEO/ATM Room 775

4201 Wilson Boulevard

Arlington, VA 22230

tel: 703-292-8527

fax: 703-292-9023

email: dverardo@nsf.gov

-----Original Message-----

From: Matt Duvall [mailto:mduvall@bates.edu]

Sent: Thursday, October 24, 2002 4:18 PM

To: ackermanr@wsu.edu; acrowell@alaska.net; Al Werner; alexander.wolfe@ualberta.ca; Amanda Lynch; ammann@ucar.edu; Anne E. Jennings; apy052\_rufus@yahoo.com; awerner@mhc.mtholyoke.edu; axford@nsidc.org; barber@ims.alaska.edu; bartlein@oregon.uoregon.edu; Bette Otto-Bliesner; Beverly Johnson; bgervais@ucla.edu; brian.huntley@durham.ac.uk; brook@vancouver.wsu.edu; Bruce Finney; clark@skio.peachnet.edu; clarkp@ucs.orst.edu; Darrell.Kaufman@nau.edu; david.lubinski@colorado.edu; ddarby@odu.edu; dean@ims.uaf.edu; dengstrom@smm.org; Devendra Lal; dfrancis@geo.umass.edu; dhardy@climate1.geo.umass.edu; dichtl@kryos.colorado.edu; dmann@mosquitonet.com; dmccorkle@whoi.edu; doner@spot.colorado.edu; drm7@midway.uchicago.edu; druid@lamont.ldeo.columbia.edu; druidrd@ldeo.columbia.edu; dstone@gi.alaska.edu; dverardo@nsf.gov; dyurg@tintin.colorado.edu; eito@umn.edu; ekarab@geol.sc.edu; elevac@tiger.1su.edu; Eric Steig; Feng-Sheng Hu; ffjeb1@uaf.edu; fflhd@uaf.edu; ffmsm@uaf.edu; ffnhb@uaf.edu; ffver@uaf.edu; finney@ims.alaska.edu; forester@usgs.gov; fortierdaniel@msn.com; francus@geo.umass.edu; fyuan@atmos.albany.edu; g.brass@arctic.gov; gcb@ldeo.columbia.edu; Glen M. MacDonald; Glenn W. Berger; glgparkr@ubvms.cc.buffalo.edu; gmiller@colorado.edu; Greg Zielinski; grimm@museum.state.il.us; hallet@u.washington.edu; harders@vancouver.wsu.edu; hrowe@uky.edu; James C. White; James Syvitski; jason.briner@colorado.edu; Jeffrey P. Severinghaus; jek@facstaff.wisc.edu; jeninga@spot.colorado.edu; jerrybrown@igc.org; jkruse@geo.umass.edu; jmcmamus@whoi.edu; John Andrews; Jonathan T. Overpeck; Joseph.Stoner@colorado.edu; juliebg@geo.umass.edu; kaplanm@geology.wisc.edu; Konrad Hughen; land@geo.umass.edu; Larry.Coats@nau.edu; lbru@u.washington.edu; Lloyd D. Keigwin; lloyd@middlebury.edu;

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Subject: New ESH AO

Dear PARCS Researcher:

The new Announcement of Opportunity is for the Earth System History (ESH) program is now posted at the NSF website ([http://www.nsf.gov/geo/egch/gc\\_esh.html](http://www.nsf.gov/geo/egch/gc_esh.html)). The AO specifically includes "Modes of Arctic Variability and Warmth" as an "Area of Research Interest" (see supporting documents on the web site or attached document). The deadline for proposals is Jan 15 and Oct 15, 2003. We encourage you to read the AO and the research plan for the Arctic emphasis, and to submit a proposal if it addresses these goals.

As this is a ESH AO your proposal need not (and indeed should not) be identified or flagged specifically as a "PARCS Proposal". Your proposal should first and foremost aim to identify how the research meets the ESH AO goals. It is, of course, appropriate in the text to note that the proposed research also addresses research objectives identified in the PARCS Science Plan if you wish.

Please contact us if you have any questions.

Glen and Darrell  
PARCS Co-Chairs

---

Mathieu Duvall	Bates College
PARCS Data Coordinator	Lewiston, ME 04240
Department of Geology	207-753-6945 (v)
mduvall@bates.edu	or matt@consulair.com

Subject: Re: majorowicz  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 11/1/02 10:08 AM  
To: "Dr. Jacek Majorowicz" <majorowicz@shaw.ca>

Thanks Jacek,

It looks very interesting, and I'll look forward to reading it in detail. Coincidentally, we've just finalized a draft of our paper on borehole/proxy comparisons, and will forward you a copy when its finalized and ready to go to press.

best regards,

Mike M

At 09:45 AM 11/2/2002 -0700, you wrote:

> Dear Dr. Mann:

> attached is my JGR Red paper.  
> hope that it will be of interest.  
> best regards  
> Majorowicz  
> Edmonton

---

Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

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e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: [Fwd: Fw: paper about natural climatic variations during the last 3000 years in Italy]  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 4/24/03 11:17 AM  
To: rbradley@geo.umass.edu, mhughes@ltr.arizona.edu

Ray,

Do you remember this guy (Dragoni) from the Venice meeting? I got a chuckle out of this particular exchange,

mike

> Date: Thu, 24 Apr 2003 20:07:57 +0200  
> From: Walter Dragoni <dragoni@unipg.it>  
> User-Agent: Mozilla/5.0 (Windows; U; Windows NT 5.1; en-US; rv:1.0.2) Gecko/20021120 Netscape/7.01  
> X-Accept-Language: en,it  
> To: Michael Mann <mann@virginia.edu>,  
> "Dr. Willie Soon" <wsoon@cfa.harvard.edu>  
> Subject: [Fwd: Fw: paper about natural climatic variations during the last  
> 3000 years in Italy]  
>  
> Dear Colleagues,  
> I have come across with your recent work about Warm Medioeval Period and Little Ice Age, as reported in the web  
site  
> <http://www.co2andclimate.org/climate/v8n16/hot.htm>  
> and I agree with your conclusions. Please read the below reported correspondence and let me know if you are  
interested in considering proxies from Italy and recent climatic variations at the millennia-century scale in this area.  
As many of the papers- reports about the issue in this area is written in Italian or in local journals, these data are  
neglected: however I think these data can help in understanding the issue of climitic change.

> Sincerely yours

Walter Dragoni

>  
>  
>  
> ----- Original Message -----

> From: "Chip Knappenberger" <chip@nhes.com>  
> Subject: Fw: paper about natural climatic variations during the last 3000 years in Italy  
> To: <dragoni@unipg.it>  
> CC: <ned@westernfuels.org>

>



>  
> Perugia University  
>  
> piazza Università 1  
>  
> 06100 - Perugia  
>  
> ITALY  
>  
>  
>  
> Email: [dragoni@unipg.it](mailto:dragoni@unipg.it)  
>  
> fax : ++39-75-5852600  
>  
> tel. : ++39-75-5852649  
>  
>  
>  
> --  
> Prof. Walter Dragoni (web: <http://www.unipg.it/~denz/drago.html>)  
> Earth Science Department - Hydrogeology Group  
> Perugia University  
> piazza Università 1  
> 06100 - Perugia  
> ITALY  
>  
> Email: [dragoni@unipg.it](mailto:dragoni@unipg.it)  
> fax : ++39-75-5852600  
> tel. : ++39-75-5852649  
>

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Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

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e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: away from my mail  
From: "Michael E. Mann" <[mem6u@multiproxy.evsc.virginia.edu](mailto:mem6u@multiproxy.evsc.virginia.edu)>  
Date: 6/10/03 11:54 AM  
To: [mhughes@ltrr.arizona.edu](mailto:mhughes@ltrr.arizona.edu)

I will away from my email through July 20.

Your message concerning "Re: revised NH comparison manuscript"  
will be read when I return.

Subject: away from my mail  
From: "Michael E. Mann" <mem6u@multiproxy.evsc.virginia.edu>  
Date: 6/20/03 1:03 PM  
To: mhughes@ltrr.arizona.edu

I will away from my email through July 20.

Your message concerning "w n american series"  
will be read when I return.

Subject: Re: Aug 1 Science issue  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 8/1/03 6:34 AM  
To: Phil Jones <p.jones@uea.ac.uk>, Tom Wigley <wigley@ucar.edu>, Keith Briffa <k.briffa@uea.ac.uk>, Michael Oppenheimer <omichael@princeton.edu>, Raymond Bradley <rbradley@geo.umass.edu>, Malcolm Hughes <mhughes@ltrr.arizona.edu>, Jonathan Overpeck <jto@u.arizona.edu>, Kevin Trenberth <trenbert@ucar.edu>, Tom Crowley <tcrowley@duke.edu>, Ben Santer <santer1@llnl.gov>, Steve Schneider <shs@stanford.edu>, Caspar Ammann <ammann@ucar.edu>, Gabi Hegerl <hegerl@duke.edu>, t.osborn@uea.ac.uk, mann@virginia.edu

Thanks Phil,

Its a stinging response indeed. For benefit of those who don't have electronic access, here is the exchange (in text),  
mike

Editor Bias on Climate Change? Science's Editor-In-Chief Donald Kennedy uses his Editorials inappropriately to advocate politically derived goals--undermining the proper role of Science and endangering credibility with the public. In "An unfortunate U-turn on carbon" (Editorial, 30 March 2001, p. 2515), he accused President George Bush of reversing his position on the Kyoto Protocol. There was no such reversal: Bush had made it quite clear during his 2000 campaign that he opposed the Protocol --echoing the U.S. Senate, which had unanimously rejected such restrictions on energy use in 1997.

Next came "The policy drought on climate change" (Editorial, 17 Jan., p. 309), in which Kennedy attacked the White House research plan for the Climate Change Science Program (CCSP). Kennedy faults the strategic plan for concentrating on, yes, science. He wants studies on regulation of energy--putting the cart before the horse! Then we get "The climate divide" (Editorial, 21 March, p. 1813), where Kennedy bemoans the CCSP's lack of recommendations for emission controls to avert what he considers a climate catastrophe that would trigger an abrupt cooling of the temperate Northern Hemisphere. But climate models predict a steady warming as greenhouse gases rise. And abrupt climate changes have been occurring throughout the history of Earth (1-3).

Kennedy also endorses a wildly implausible British plan to reduce their CO2 emissions by 60% by 2050--with mostly wind power and without the use of nuclear reactors. But just a week later, we read that stabilization of global climate (or at least its alleged human component) would require installing carbon-free primary power at the rate of 1000 MW each day over the next 50 years (4). That's like adding an amount of nuclear capacity every year equal to what is now in existence globally.

The Editorials basically call for drastic action to limit carbon dioxide emissions, like sequestering CO2 from power plants or the rationing of energy by legislated cap-and-trade schemes--all costly but also ineffective (5). Kennedy even suggests that Bush's refusal to join Kyoto has provoked European resentment with respect to the Iraq problem.

Kennedy keeps insisting that "[t]he scientific evidence on global warming is now beyond doubt" (17 Jan.). Presumably, he sees no need for further climate-science research--contrary to evidence published in his own journal (6, 7) to which he responded dismissively. There isn't even solid evidence for current warming: A National Research Council report (8) confirms that the atmosphere has not warmed appreciably for the past 20-odd years. And there are no "fingerprints" that would assign any observed surface warming trends to human-produced greenhouse gases.

Just a week before Kennedy's 21 March Editorial, researchers suggested a completely different picture on what drove

rapid climate change at the end of the most recent ice age (9). And on 28 March, another group had to admit that it was not known what produces abrupt climate change (10). Maybe we do need to know more science before we charge blindly ahead with ruinous mitigation schemes based on opinions.

S. Fred Singer\*

The Science & Environmental Policy Project (SEPP),  
1600 S. Eads Street,  
Suite 712-S,  
Arlington, VA 22202-2907,  
USA.

E-mail: [singer@sepp.org](mailto:singer@sepp.org)

\*Former director of the U.S. Weather Satellite Service and professor emeritus of Environmental Sciences, University of Virginia

References and Notes

J. C. Stager, P. A. Mayewski, *Science* 276, 1834 (1997).

J. F. McManus, D. W. Oppo, J. L. Cullen, *Science* 283, 971 (1999).

T. F. Stocker, *Quat. Sci. Rev.* 19, 301 (2000).

K. Caldeira, A. K. Jain, M. I. Hoffert, *Science* 299, 2052 (2003).

M. Parry et al., *Nature* 395, 741 (1998).

S. F. Singer, *Science* 292, 1063 (2001).

See testimony to Senate Commerce Committee (18 July 2000) (available at [www.sepp.org/NewSEPP/senatetestimony.htm](http://www.sepp.org/NewSEPP/senatetestimony.htm)).

National Research Council, *Reconciling Observations of Global Temperature Change* (National Academy Press, Washington, DC, 2000). The NRC panel could not account for the disparity between surface thermometers that show a warming trend and weather satellite and (independent) radiosonde observations that show no appreciable warming of the lower atmosphere since 1979.

A. J. Weaver, O. A. Saenko, P. U. Clark, J. X. Mitrovica, *Science* 299, 1709 (2003).

R. B. Alley et al., *Science* 299, 2005 (2003).

Response

Some climate scientists criticized me for publishing Fred Singer's earlier letter [(5) in his letter], in which he attempted to rebut--as he does here--the consensus of the Intergovernmental Panel on Climate Change and of most scientists. I'm doing it again, even though his case is old wine in a new bottle, because I think it important for Science's readers to hear and to evaluate a position that is still taken by many industry and political leaders. I invite those readers to examine Singer's selection from the scientific literature. His references (8) and (9) add to our knowledge about the history of abrupt climate change, but say nothing against the consensus for contemporary global warming and, if anything, support growing concerns that its continuation might produce dramatic, nonlinear responses. He ignores the recent Report by B. D. Santer et al. (1), which shows that the alleged discrepancy between surface and satellite measurements of global temperature--of which he made much in his earlier letter--is largely attributable to inconsistencies in the satellite data.

Much of his argument with me is about three Editorials, and he has misread each one of them. In the first, the word "Kyoto" does not appear; the U-turn I described was Bush's reversal on his campaign commitment (later called a "mistake" by a White House spokesperson) to include carbon dioxide among the four regulated atmospheric pollutants. The second never faulted the science in the administration's plan, but pointed out that its focus on long-range alternative energy research unfortunately bypassed the need for shorter-range remediation strategies. The third did not label abrupt cooling as the likely alternative to continued "steady warming"; it pointed out that the former has received increasing support from new studies.

Donald Kennedy

Reference

B. D. Santer et al., *Science* 300, 1280 (2003).

At 01:50 PM 8/1/2003 +0100, Phil Jones wrote:

>> Dear All,

> The letter exchange on pp595-6 is worth a read. The Science Editor-in-Chief's response  
> is a fantastic put down ! Brilliant - should be rammed down Singer's throat when he does  
> similar things in the future. I hope Kennedy enjoyed writing it as much as I enjoyed reading it.  
> I can't see Singer writing to Science again !

> Cheers

> Phil

> Prof. Phil Jones

> Climatic Research Unit Telephone +44 (0) 1603 592090

> School of Environmental Sciences Fax +44 (0) 1603 507784

> University of East Anglia

> Norwich Email p.jones@uea.ac.uk

> NR4 7TJ

> UK -----

>

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Professor Michael E. Mann

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<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: McIntyre-McKittrick and Mann-Bradley-Hughes

From: Tim Osborn <t.osborn@uea.ac.uk>

Date: 11/1/03 10:37 AM

To: Timo Hämeranta <timo.hameranta@pp.inet.fi>, "S. Fred Singer" <singer@sepp.org>, "Richard A. Anthes" <anthes@ucar.edu>, "Richard B. Alley" <ralley@essc.psu.edu>, "Richard E. Moritz" <dickm@apl.washington.edu>, "Richard Gammon" <gammon@u.washington.edu>, "Richard H. Moss" <Richard.Moss@pnl.gov>, "Richard Seager" <seager@ldeo.columbia.edu>, "Robert A. Bindshadler" <Robert.A.Bindshadler@nasa.gov>, "Robert B. Dunbar" <dunbar@stanford.edu>, "Robert J. Charlson" <charlson@chem.washington.edu>, "Robert J. Lempert" <lempert@rand.org>, "Robert Mendelsohn" <robert.mendelsohn@yale.edu>, "Robert Sausen" <robert.sausen@dlr.de>, "Roger A. Pielke Sr." <pielke@atmos.colostate.edu>, "Rolf Sartorius" <rolf.sartorius@uba.de>, "Ronald J. Stouffer" <Ronald.Stouffer@noaa.gov>, "Roy W. Spencer" <roy.spencer@msfc.nasa.gov>, "Sami Solanki" <solanki@linmpi.mpg.de>, "Sarah Raper" <s.raper@uea.ac.uk>, "Shan Sun" <ssun@giss.nasa.gov>, "Simon F.B. Tett" <sfbtett@metoffice.com>, "Stefan Rahmstorf" <rahmstorf@pik-potsdam.de>, "Stephen G. Warren" <sgw@atmos.washington.edu>, "Stephen H. Schneider" <shs@leland.stanford.edu>, "Stephen J. Burns" <sburns@geo.umass.edu>, "S. W. Pacala" <pacala@princeton.edu>, "Steven C. Wofsy" <wofsy@fas.harvard.edu>, "Surabi Menon" <smenon@giss.nasa.gov>, "Susan Solomon" <ssolomon@al.noaa.gov>, "Theodore L. Anderson" <tadand@atmos.washington.edu>, "Thomas R Karl" <Thomas.R.Karl@noaa.gov>, "Tim P. Barnett" <tbarnett@ucsd.edu>, "Timothy J. Osborn" <t.osborn@uea.ac.uk>, "Tom Krimigis" <tom.krimigis@jhuapl.edu>, "Tom M. L. Wigley" <wigley@ucar.edu>, "Tracey Holloway" <tah@gfdl.noaa.gov>, "Trevor J. Lewis" <tlewis@nrcan.gc.ca>, "Ulrich Berner" <ulrich.berner@bgr.de>, "Ulrich Cubasch" <cubasch@zedat.fu-berlin.de>, "Ulrich Neff" <Uli.Neff@iup.uni-heidelberg.de>, "V. Ramanathan" <neu@sanw.unibe.ch>, "V. Ramanathan" <vr@gsfc.nasa.gov>, "Wallace S. Broecker" <vr@gsfc.nasa.gov>

ABOR/MH/Non-Priv-00350

<broecker@ldeo.columbia.edu>, "Walter Munk >" <wmunk@ucsd.edu>, Thom Rahn <trahn@lanl.gov>, "Michael E. Mann" <mann@virginia.edu>, "raymond s. bradley" <rbradley@geo.umass.edu>, "Malcolm Hughes >," <mhughes@ltrr.arizona.edu>, "> Keith Briffa" <t.osborn@uea.ac.uk>, "> Mike MacCracken," <mmaccrac@comcast.net>, "> Michael Oppenheimer," <omichael@princeton.edu>, "> Stephen H Schneider" <shs@stanford.edu>, <smcintyre@cgxenergy.com>, <art@oism.org>, <sbaliunas@cfa.harvard.edu>, <fspilhaus@agu.org>, <jmarburg@ostp.eop.gov>, <Vicki.Horton@noaa.gov>, <rmckitri@uoguelph.ca>, <James.R.Mahoney@noaa.gov>, <dek@uclink4.berkeley.edu>, <pabelson@aaas.org>, <wsoon@cfa.harvard.edu>, <rlindzen@mit.edu>, <seitz@rockvax.rockefeller.edu>, <cstarr@epri.com>, <p.jones@uea.ac.uk>

This is a response to the recent emails related to the McIntyre and McKittrick (Energy and Environment, 14, 751-771, 2003) study of the Northern Hemisphere temperature reconstruction previously published by Mann, Bradley and Hughes (Nature, 392, 779-787, 1998).

We suggest that those interested in the claim made by McIntyre and McKittrick (MM) should also read the initial response from Mann and his colleagues.

This initial response is attached to this email, and we have also posted it on our website:

<http://www.cru.uea.ac.uk/~timo/paleo/>

According to this initial response, it looks likely that there are serious questions regarding the manner in which MM have attempted to implement the Mann et al. method, and specific problems with the selection of predictors.

Amazingly, the journal "Energy and Environment" that published the MM work, made no attempt to provide Mann et al. with the opportunity to review the MM paper or establish the details of the MM work.

Objective readers, with a desire to get to the "truth" of this issue, would do well not to jump to premature conclusions and at least allow these respected, experienced, and invariably careful researchers the courtesy of a considered response, after they have had time to study the so-called audit in detail.

Dr. Tim Osborn, Professor Keith Briffa and Professor Phil Jones  
Climatic Research Unit, University of East Anglia, Norwich, UK

-- Dr. Timothy J. Osborn Climatic Research Unit University of East Anglia Norwich NR4 7TJ, UK. Telephone: 01603 592089 Fax: 01603 507784 e-mail: [t.osborn@uea.ac.uk](mailto:t.osborn@uea.ac.uk) homepage: <http://www.cru.uea.ac.uk/~timo>

Attachments:

EandEPaperProblem.pdf 100 KB

Subject: Re: AGU Press Conference

From: "Michael E. Mann" <mann@virginia.edu>

Date: 11/13/03 3:41 PM

To: Caspar Ammann <ammann@ucar.edu>, Tom Crowley <tcrowley@duke.edu>, Malcolm Hughes <mhughes@ltrr.arizona.edu>

Dear Caspar,

ABOR/MH/Non-Priv-00351

I think I'll respectfully decline this time. I did one of these a couple years ago (Spring AGU), and I think its time to give other folks a chance to be involved. I think you probably have at least a dozen people in your session that would be worth involving in this, so please use the slot you were thinking of me to give someone else a chance...

thanks,

mike

At 02:52 PM 11/13/2003 -0700, Caspar Ammann wrote:

> Mike, Tom and Malcolm,

>

> we were asked by Harvey Leifert if we would like to hold an AGU press conference on some of topics covered by the session. It appears to me that there are a number of excellent points that we could get accross to the public based on this session and I wanted to ask you if you would be willing and be available on Thursday, Dec. 11th at 2pm for a press conference to give a brief resume of your presentations.

>

> Please let me know as soon as possible so that we can have the time reserved. I will send you details later.

>

> Cheers,

> Caspar

>

> --

> Caspar M. Ammann

> National Center for Atmospheric Research

> Climate and Global Dynamics Division - Paleoclimatology

> 1850 Table Mesa Drive

> Boulder, CO 80307-3000

> email: ammann@ucar.edu tel: 303-497-1705 fax: 303-497-1348

>

>

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Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

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e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137

<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: away from my mail

From: "Michael E. Mann" <mem6u@multiproxy.evsc.Virginia.EDU>

Date: 12/15/03 3:11 PM

To: mhughes@lrr.arizona.edu

I will travelling and away from my email through Friday, December 19.

Your message concerning "Nature"  
will be read when I return.

Subject: Re: Corrections of your paper

ABOR/MH/Non-Priv-00352

From: "Michael E. Mann" <mann@virginia.edu>  
Date: 1/3/04 9:36 PM  
To: Lubos Motl <motl@feynman.harvard.edu>  
CC: john\_holdren@harvard.edu, jmccarth@oeb.harvard.edu, schrag@eps.harvard.edu

Dear Dr. Motl,

Your internet search seems to have been seriously lacking.

I would suggest you consider this commentary provided by an independent group of paleoclimate researchers on the matter here:

<http://www.cru.uea.ac.uk/~timo/paleo/>

I would suggest that you also refer to our preliminary response which identifies fundamental flaws in the paper you so uncritically cite:

<http://holocene.evsc.virginia.edu/Mann/EERreply.html>

I would also suggest that you see what climate scientists and statisticians have had to say about the matter in the mainstream press, such as this news article in USA Today:

[http://www.usatoday.com/weather/climate/2003-11-18-warming-debate\\_x.htm](http://www.usatoday.com/weather/climate/2003-11-18-warming-debate_x.htm)

Had you adequately researched the matter before sending this email, you might have learned that at least a dozen independent studies have come to similar conclusions to those provided by our work. For example, see:

Mann, M.E., Ammann, C.M., Bradley, R.S., Briffa, K.R., Crowley, T.J., Hughes, M.K., Jones, P.D., Oppenheimer, M., Osborn, T.J., Overpeck, J. T., Rutherford, S., Trenberth, K.E., Wigley, T.M.L., Response to Comment on 'On Past Temperatures and Anomalous Late 20th Century Warmth', Eos, 84, 473, 2003.

or

Jones, P.D., T.J. Osborn, and K.B. Briffa, The Evolution of Climate Over the Last Millennium, Science--Paleoclimate Review, 292, 662-667, 2001.

The piece you cite was not published in the peer-reviewed scientific literature, but rather, a social science journal with an editor who expresses some very odd opinions about the virtue of peer review.

Since my co-authors and I adhere to standard scientific protocols, we have indeed submitted a formal response to the piece you refer to. Unlike that piece, however, our response has been submitted to the peer-reviewed scientific literature so that the accuracy of the findings can actually be evaluated by those qualified to do so. Our preliminary response, the link to which is provided above, however, should be more than adequate to disabuse you of many of the misconceptions expressed in your email, and to bring to your attention the critical errors in the paper you cite (the most significant of which is the elimination from the pool of predictors of roughly 80% of the proxy data used by my co-authors and I in our analysis prior to the year AD 1600).

Due to other demands on my time, I will not be able to consider any further inquiries from you. I would suggest that in the future you do far more background research before sending out such email messages.

Best regards, and a happy new year to you,

Michael E. Mann

At 10:30 PM 1/3/2004 -0500, Lubos Motl wrote:

> Dear Prof. Mann,

>

> we've spent a day by analyzing your paper MBH98 vs. the paper by  
> McKittrick and McIntyre, and it seems pretty clear to us that at least  
> some of the alleged errors (in fact, many) of your paper are real, and  
> they look serious enough.

>

> Do you plan to publish a corrected version of your paper from 1998 and  
> 1999? It seems pretty necessary. On the Internet, we have not been able to  
> find a single piece of evidence that McKittrick's and McIntyre's  
> accusations are false. Is that because their criticism is totally correct?  
> Are we missing some important data? I am a theoretical physicist, but it  
> is not so terribly difficult to reconstruct the procedures giving the  
> temperature index.

>

> I think that if you don't publish a corrected version, it will become  
> increasingly clear that the errors in your article have been made  
> deliberately. If it is the case, I think that the defects incorporated  
> into your articles are very serious, especially because of the influence  
> that your articles have had, and it would take less than one year for the  
> majority of the scientific community to realize that we have been fooled  
> for years, and some appropriate measures would have to be taken not to  
> repeat such a painful history in the future.

>

> Thanks for your answer and a Happy New Year.

>

> Best regards

> Dr. Lubos Motl, Harvard University

>

> E-mail: [lumo@matfyz.cz](mailto:lumo@matfyz.cz) fax: +1-617/496-0110 Web: <http://lumo.matfyz.cz/>

> phone: work: +1-617/ [REDACTED] home: +1-617/ [REDACTED]

> ~~~~~

> Superstring/M-theory is the language in which God wrote the world.

---

Professor Michael E. Mann

Department of Environmental Sciences, Clark Hall

University of Virginia

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e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (434) 924-7770 FAX: (434) 982-2137

<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: amusing...

From: "Michael E. Mann" <[mann@virginia.edu](mailto:mann@virginia.edu)>

Date: 7/12/04 10:23 AM

To: [rbradley@geo.umass.edu](mailto:rbradley@geo.umass.edu), [mhughes@ltr.arizona.edu](mailto:mhughes@ltr.arizona.edu), Phil Jones <[p.jones@uea.ac.uk](mailto:p.jones@uea.ac.uk)>

Guys,

Someone just pointed this out to me. You might get some amusement out of it:

<http://releases.usnewswire.com/GetRelease.asp?id=117-07122004>

Apparently, the 'hockey stick' is now the work of Mann and Jones alone!

It gets things so wrong on the most basic facts, its hard not to chuckle.

Usually, these sorts of press releases are completely ignored by the press. But I thought I'd give you a heads up nonetheless...

Mike

---

Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

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e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: Re: Comments

From: "Michael E. Mann" <[mann@virginia.edu](mailto:mann@virginia.edu)>

Date: 7/19/04 12:12 PM

To: Mokhov\_ifaran <[mokhov@ifaran.ru](mailto:mokhov@ifaran.ru)>

CC: [rbradley@geo.umass.edu](mailto:rbradley@geo.umass.edu), [mhughes@ltrr.arizona.edu](mailto:mhughes@ltrr.arizona.edu), "Stott, Peter" <[peter.stott@metoffice.com](mailto:peter.stott@metoffice.com)>, Phil Jones <[p.jones@uea.ac.uk](mailto:p.jones@uea.ac.uk)>

Dear Dr. Mokhov,

Thanks very much for your inquiry. I have taken the liberty of cc'ing your inquiry and my reply to my co-authors and also some other colleagues who may have an interest and useful comments on this matter.

I was indeed told by some colleagues that an attempt was made to peddle the junk science of McIntyre and McKitrick at the recent meeting in Russia. The first thing you should be aware of is that "Energy and Environment" is not a scientific journal (and the authors, McIntyre and McKitrick, are not even scientists!). So the claims made by them never even passed a legitimate scientific peer-review process. That's the first issue which should raise some alarm bells.

You can see what other leading climate scientists such as Tom Wigley have already had to say about their paper in the widely circulated U.S. newspaper "USA Today":

[http://www.usatoday.com/weather/climate/2003-11-18-warming-debate\\_x.htm](http://www.usatoday.com/weather/climate/2003-11-18-warming-debate_x.htm)

Several papers recently published, in press, or soon to be in press, in the actual peer-reviewed scientific literature discredit their claims entirely. It has been shown that McIntyre and McKitrick achieved their result through censoring important proxy data that were used in the original analysis by Mann et al (1998) prior to AD 1600. As shown by an independent analysis by other researchers soon to be published, when those proxy data are eliminated from the network used by Mann et al, the McIntyre and McKitrick is indeed reproduced. However, an even more important result emerges that was never disclosed by those authors. The associated reconstruction dramatically fails statistical verification prior to AD 1500 (precisely the interval during which a significantly different result--anomalous 15th century warmth--was produced by McIntyre and Mckitrick, through the censoring of the Mann et al proxy data set). The reconstruction, in that case, performs essentially no better in statistical verification tests than a purely random statistical estimate--in other words, their reconstruction prior to AD 1500 is nonsense from a statistical point of view.

ABOR/MH/Non-Priv-00355

This is in contrast to the result of Mann et al (1998), in which the reconstruction, using the full available proxy data network, was demonstrated to have significant statistical skill back to AD 1400.

I have attached a review paper by Jones and Mann recently published in "Reviews of Geophysics" which discredits the McIntyre and McKitrick paper, briefly discussing these results (see page 21 therein). As I mentioned, several papers in the pipeline (in press or soon to be in press) offering further details, are soon to appear. The net result is that the claims of McIntyre and Mckitrick have been discredited already, and will be increasingly discredit over the next several months as these other papers appear.

In the attached review paper by Jones and Mann, it is shown (see Figures 5 and 8) that there are more than a dozen different proxy-based or model-based estimates of Northern Hemisphere temperature changes over the past 400-1000 years that agree with the original estimate of Mann et al (1998) within uncertainties. In none of these estimates is there any evidence of the spurious anomalous 15th century warmth produced by McIntyre and McKitrick. I have also attached a paper that appeared in "Eos" last year, co-authored by many of the leading U.S. and western European scientists working in this area, coming to the same conclusion.

You may wish to consult with other scientists, such as Phil Jones or Peter Stott whom I have cc'd to this message, to find out what mainstream climate researchers think of the claims of McIntyre and McKitrick.

I hope this information is of some help to you.

Best regards, and thanks again for the 'heads up',

Mike Mann

At 02:26 PM 7/19/2004, Mokhov\_ifaran wrote:

> Dear Dr. Mann,  
>  
> Would it be possible to receive your comments/remarks concerning the  
> paper by S. McIntyre and R. McKitrick "Corrections to the Mann et al.  
> (1998) proxy data base and Northern hemispheric average temperature series"  
> (Energy&Environment, 2003, V.14, No.6, 751-771) with corrections to your  
> publications (in particular: Nature, 1998; GRL, 1999)? Copies of this  
> publication by McIntyre and McKitrick were spreaded at the special  
> Council-seminar on problems of Kyoto Protocol in the Russian Academy of  
> Sciences. This is regular (since the end of January 2004) seminar organized  
> at the RAS Presidium. The publication mentioned above is one of arguments of  
> Andrey Illarionov (advisor of the Russian President) to criticize the IPCC-2001  
> report at this Council-seminar and other meetings. I hope your  
> comments (may be appropriate publications are already available) will be  
> important not just for me but also for other participants of this RAS  
> Council-seminar before preparation of seminar's conclusions in July (this  
> week or next week).

> Thank you in advance.

> Sincerely yours,

> Igor Mokhov

> \*\*\*\*\*

> Igor I. Mokhov

> A.M.Obukhov Institute of Atmospheric Physics

> Russian Academy of Sciences

> 3 Pyzhevsky

> Moscow 119017  
> Russia  
>  
> Tel.: 7 (095) 951 13 47 or 7 (095) 951 64 53  
> Fax: 7 (095) 953 16 52  
> E-mail: mokhov@ifaran.ru

---

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---

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<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Attachments:

JonesMannROG04.pdf 1.4 MB  
eos03.pdf 602 KB

Subject: Fwd: Re: Miami Herald  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 8/2/04 2:48 PM  
To: mhughes@ltrr.arizona.edu

> Date: Mon, 02 Aug 2004 17:30:56 -0400  
> To: "raymond s. bradley" <rbradley@geo.umass.edu>  
> From: "Michael E. Mann" <mann@virginia.edu>  
> Subject: Re: Miami Herald  
>  
> HI Ray,  
>  
> You should have read my my 2nd email first. Both letters made it, they were in yesterday's herald. I've attached a pdf just in case you can't get through the subscription barrier...

> Mike  
>  
> At 05:31 PM 8/2/2004, raymond s. bradley wrote:  
>> no  
>>  
>> ray  
>>  
>> At 03:53 PM 8/2/2004, you wrote:  
>>> Ray,  
>>>  
>>> Apparently Amy never heard back from the "Miami Herald". I assume that you didn't either...  
>>>  
>>> Mike  
>>>

---

>>> Professor Michael E. Mann  
>>> Department of Environmental Sciences, Clark Hall  
>>> University of Virginia

>>> Charlottesville, VA 22903

>>> e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137  
>>> <http://www.evsc.virginia.edu/faculty/people/mann.shtml>

>> Raymond S. Bradley  
>> Director, Climate System Research Center\*  
>> Department of Geosciences, University of Massachusetts  
>> Morrill Science Center  
>> 611 North Pleasant Street  
>> AMHERST, MA 01003-9297  
>> Tel: 413-545-2120  
>> Fax: 413-545-1200  
>> \*Climate System Research Center: 413-545-0659  
>> <<http://www.paleoclimate.org>>  
>> Paleoclimatology Book Web Site: <http://www.geo.umass.edu/climate/paleo/html>

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> <http://www.evsc.virginia.edu/faculty/people/mann.shtml>

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<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Attachments:

MiamiHeraldResponse.pdf 156 KB

Subject: Re: revs to the hockey stick graph  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 9/22/04 6:09 AM  
To: "stephen e. schwartz" <ses@bnl.gov>  
CC: mann@virginia.edu

Hi Steve,

Thanks for your inquiry.

I should first clarify that the results of our Nature reconstruction has in no way changed or been revised. The update in the supplementary information that I think you're referring to which appeared as a 'corrigendum' in Nature a couple months ago (available here: <http://holocene.evsc.virginia.edu/Mann/research/research.html>) simply pointed out that there were some typos or other minor errors in the listing of the proxy data that were used in that study. The results, as stated clearly in the corrigendum, are in no way altered and stand as originally published.

ABOR/MH/Non-Priv-00358



> PO Box 5000 Upton NY 11973-5000  
>  
> Home Page: <http://www.ecd.bnl.gov/steve/schwartz.html>  
> Admin Asst: Barbara Roland (mailto:roland@bnl.gov)  
>  
> DOE Atmospheric Science Program: <http://www.atmos.anl.gov/ASP>  
> -----

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<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: Re: revs to the hockey stick graph  
From: "Michael E. Mann" <[mann@virginia.edu](mailto:mann@virginia.edu)>  
Date: 9/22/04 6:29 AM  
To: "stephen e. schwartz" <[ses@bnl.gov](mailto:ses@bnl.gov)>

Hi Steve,

Thanks--yet Figure 5 of the ROG paper would be a good one to show.

I fear I need to clarify the matter of MBH98 a bit further here.

There were no changes at all in the proxy data used, or in the reconstructions produced \*at all\*. i.e., there is literally no reanalysis or replotting to be done. It is simply that the \*description\* of the data provided on the original supplementary website for the Nature article had some errors in it. So somebody trying to repeat the analysis exactly would run into problems in assembling the correct dataset, i.e. precisely the same data set that we used. We used the correct data, as listed in the corrected supplementary information, in the original analysis. So there are no changes in data used, no changes in any results, and every result shown in our original '98 article stands correct \*precisely\* as originally shown!

I hope that clarifies this. I fear others may have been similarly confused, despite our best attempts to make clear that the corrections of the description does not effect the results in any way...

Again, it doesn't help that some out there have tried to create confusion about the matter...

best regards,

mike

At 09:20 AM 9/22/2004, stephen e. schwartz wrote:

> perfect; thanks; and thanks for the quick reply. I think fig 5 of the rev  
> geophys paper is just what I want.  
>  
> I did not mean to suggest that there were substantive changes, but rather  
> figured that, given all the tabular data on the nature corrigenda web site,  
> it seemed to call for a re-plot, which I figured you had done, as you have.  
>

> thanks again.  
>  
> -steve  
>  
> (and of course I acknowledge the original papers when I give a talk.)  
>  
> -s  
>  
> -----  
>  
>> Hi Steve,  
>>  
>> Thanks for your inquiry.  
>>  
>> I should first clarify that the results of our Nature reconstruction has  
>>in no way changed or been revised. The update in the supplementary  
>>information that I think you're referring to which appeared as a  
>>'corrigendum' in Nature a couple months ago (available here:  
>><[http://holocene.e](http://holocene.evsc.virginia.edu/Mann/research/research.html)  
>>vsc.virginia.edu/Mann/research/research.html>  
>> simply pointed out that there were some typos or other minor errors in  
>>the listing of the proxy data that were used in that study. The results,  
>>as stated clearly in the corrigendum, are in no way altered and stand as  
>>originally published. Some of the notorious 'climate contrarians' have  
>>intentionally tried to create some confusion about this on the various  
>>industry-funded contrarian web sites, etc.  
>>  
>> On the other hand, there has been quite a bit of progress in empirical  
>>and model-based reconstructions of hemispheric temperatures over the past  
>>millennium (or longer) since our '98 article.  
>>  
>> A good discussion (and some useful graphics) are available in this review  
>>paper that Phil Jones and I recently published:  
>>  
>> Jones, P.D., Mann, M.E.,  
>><<ftp://holocene.evsc.virginia.edu/pub/mann/JonesMannROG04.pdf>>Climate Over  
>>Past Millennia, Reviews of Geophysics, 42, RG2002, doi:  
>>10.1029/2003RG000143, 2004  
>><[ftp://holocene.ev](ftp://holocene.evsc.virginia.edu/pub/mann/JonesMannROG04.pdf)  
>>sc.virginia.edu/pub/mann/JonesMannROG04.pdf>  
>>  
>> And also in a lecture I gave at the "CLIVAR" conference in Baltimore last  
>>July.  
>>  
>><[http://holocene.e](http://holocene.evsc.virginia.edu/Mann/lectures/lectures.html)  
>>vsc.virginia.edu/Mann/lectures/lectures.html>  
>>  
>> Other recent related articles are available here:  
>>  
>><[http://holocene.e](http://holocene.evsc.virginia.edu/Mann/articles/articles.html)  
>>vsc.virginia.edu/Mann/articles/articles.html>  
>>  
>> Please feel free to make use of any of these materials, and please don't  
>>hesitate to let me know if I can be of further help to you.

>>  
>> Thanks again for your interest, and best regards,

>>  
>> Mike

>>  
>> At 08:59 AM 9/22/2004, stephen e. schwartz wrote:

>>  
>>  
>> Hello Michael Mann

>>  
>> I have been showing your so-called hockey stick graph in talks that I have  
>> been giving for the last several years (thank you) and am wondering whether  
>> you have plotted up the revised version of your data (as given on the  
>> Nature supplemental information pages) in a similar way, showing the  
>> several data sets:

>>  
>> Reconstruction (AD 1000-1980)  
>> Instrumental data (AD 1902-1998)  
>> Calibration period (AD 1902-1980) mean  
>> Reconstruction (40 year smoothed)  
>> Linear trend (AD 1000-1850)

>>  
>> and the uncertainty band as plotted in the original papers.

>>  
>> If so, would appreciate a copy of same or reference or link to same.

>>  
>> thanks

>>  
>> steve schwartz

>>  
>> \_\_\_\_\_  
>> Professor Michael E. Mann  
>> Department of Environmental Sciences, Clark Hall  
>> University of Virginia  
>> Charlottesville, VA 22903

>> \_\_\_\_\_  
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>>  
>> <<http://www.evsc.virginia.edu/faculty/people/mann.shtml>><http://www.evsc.virginia.edu/faculty/people/mann.shtml>

>>  
>>  
>> -----

> Stephen E. Schwartz, Senior Scientist                   mailto:ses@bnl.gov  
> Atmospheric Sciences Division                           Phone: (631) 344-3100  
> Brookhaven National Laboratory                        Fax: (631) 344-2887  
> Bldg. 815E (75 Rutherford Dr.)                        Admin. Asst: (631) 344-3275  
> PO Box 5000 Upton NY 11973-5000

>  
> Home Page: <http://www.ecd.bnl.gov/steve/schwartz.html>  
> Admin Asst: Barbara Roland (mailto:roland@bnl.gov)

>  
> DOE Atmospheric Science Program: <http://www.atmos.anl.gov/ASP>  
ABOR/MH/Non-Priv-00362

> -----

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<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: Fwd: AAAS elections (fwd)  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 10/4/04 2:27 PM  
To: Gavin Schmidt <gavin@isotope.giss.nasa.gov>, Drew Shindell <dshindell@giss.nasa.gov>, jto@u.arizona.edu, rbradley@geo.umass.edu, mhughes@ltrr.arizona.edu, Jeffrey.Park@yale.edu

Dear Friends,

This passed along to me from David Thomson. With enemies like this, my candidacy might really have a chance :)

mike

> Date: Mon, 4 Oct 2004 15:25:30 -0400 (EDT)  
> From: "David J. Thomson" <djt@mast.queensu.ca>  
> To: mann@virginia.edu  
> Subject: AAAS elections (fwd)  
> X-UVA-Virus-Scanned: by amavisd-new at fork10.mail.virginia.edu

>  
> Mike,  
> Good to see that you have friends:-)  
> You must be doing something right, keep up the  
> good work.  
> Cheers  
> Dave

>  
> ----- Forwarded message -----  
> Date: Mon, 04 Oct 2004 14:42:50 -0400  
> From: S. Fred Singer <singer@sepp.org>  
> To: info@sepp.org  
> Subject: AAAS elections

>  
>  
> If you are a AAAS member , you will receive election ballots  
> \*\*\*\*\*  
>  
> President: pls vote for Moniz. Holdren would be a disaster  
>  
> Board of Directors: I voted for Enquist and Fri  
>  
> Common Nominations: I voted for Hu, Schlesinger, and Schwartz  
> \*\*\*\*\*

- >
- > Section on Atm Sciences
- >
- > Chair: I voted for Penner over Robock
- >
- > Member at Large: Definitely Prospero not Mann
- >
- > Nomin Comm : Pfirman and Zeeman
- >
- > Delegate: Reeburgh
- > \*\*\*\*\*
- > Hope our guys win
- >
- > Fred

---

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---

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<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: Fwd: cut and pasted version  
From: "Michael E. Mann" <[mann@virginia.edu](mailto:mann@virginia.edu)>  
Date: 2/15/05 6:02 AM  
To: [mhughes@ltrr.arizona.edu](mailto:mhughes@ltrr.arizona.edu)

- > From: "Kalee Kreider" <[kalee@fenton.com](mailto:kalee@fenton.com)>
- > To: "Gavin Schmidt" <[gschmidt@giss.nasa.gov](mailto:gschmidt@giss.nasa.gov)>,  
> "Michael Mann" <[mann@virginia.edu](mailto:mann@virginia.edu)>
- > Subject: cut and pasted version
- > Date: Mon, 14 Feb 2005 09:35:49 -0500
- > X-Mailer: Microsoft Outlook IMO, Build 9.0.6604 (9.0.2911.0)
- > X-UVA-Virus-Scanned: by amavisd-new at fork10.mail.virginia.edu
- >
- > nice line drawing mike...odd that he doesn't mention the new study in Nature--maybe he submitted this story before  
it came out?
- > KK
- >
- > PAGE ONE
- > [] [] [] []
- > Click to email this article Click to email this article Click to format this article for printing Click to format this  
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- > Global Warring
- > In Climate Debate,
- > The 'Hockey Stick'
- > Leads to a Face-Off

> Nonscientist Assails a Graph  
> Environmentalists Use,  
> And He Gets a Hearing  
> Defenders Call Attack Political

>  
> By ANTONIO REGALADO  
> Staff Reporter of THE WALL STREET JOURNAL  
> February 14, 2005; Page A1

>  
> One of the pillars of the case for man-made global warming is a graph nicknamed the hockey stick. It's a reconstruction of temperatures over the past 1,000 years based on records captured in tree rings, corals and other markers. The stick's shaft shows temperatures oscillating slightly over the ages. Then comes the blade: The mercury swings sharply upward in the 20th century.

>  
> The eye-catching image has had a big impact. Since it was published four years ago in a United Nations report, hundreds of environmentalists, scientists and policy makers have used the hockey stick in presentations and brochures to make the case that human activity in the industrial era is causing dangerous global warming.

>  
> But is the hockey stick true?

>  
> According to a semiretired Toronto minerals consultant, it's not. After spending two years and about \$5,000 of his own money trying to double-check the influential graphic, Stephen McIntyre says he has found significant oversights and errors. He claims its lead author, climatologist Michael Mann of the University of Virginia, and colleagues used flawed methods that yield meaningless results.

> [Stephen McIntyre]

>  
> Dr. Mann vigorously disagrees. On a Web site launched with the help of an environmental group ([www.realclimate.org](http://www.realclimate.org)), he has sought to debunk the debunking, and counter what he calls a campaign by fossil-fuel interests to discredit his work. "It's a battle of truth versus disinformation," he says.

>  
> But some other scientists are now paying attention to Mr. McIntyre. Although a scientific outsider, the 57-year-old has forced Dr. Mann to publish a minor correction. Now a critique by Mr. McIntyre and an ally is being published in a respected scientific journal. Some mainstream scientists who harbored doubts about the hockey stick say its comeuppance is overdue.

>  
> The clash has grown into an all-out battle involving dueling Web logs ([www.climateaudit.org](http://www.climateaudit.org)), a powerful senator and a score of other scientists. Mr. McIntyre's new paper is circulating inside energy companies and government agencies. Canada's environment ministry has ordered a review.

>  
> Mr. McIntyre's critique isn't going to settle the broader global-warming debate. Indeed, he takes no strong position on whether fossil-fuel use is heating the planet or, if so, how to cope. He just says he has found a flaw in a main leg supporting the global-warming consensus, the consensus that led to an international initiative taking effect this week: Kyoto.

>  
> The Kyoto protocol obligates the 35 industrialized nations that ratified it -- which don't include the U.S. -- to reduce emissions of six gases 5% below 1990 levels by 2012. The thinking behind it is straightforward: Human activity, especially the burning of fossil fuels, generates carbon dioxide, methane and other gases that accumulate in the atmosphere; there they trap the sun's heat the way a greenhouse does; to reduce the heat, reduce the gases.

>  
> But that will mean far-reaching industrial changes. Mr. McIntyre's complaint is that supporters of Kyoto pushed for it by wielding a graph, the hockey stick, whose validity they'd never fully scrutinized. "Give me a break -- we are making billion-dollar decisions," he says, noting that businesses, by contrast, must carefully audit their financial statements and projections.

>

> Many skeptics contend that liberal environmental agendas are behind alarming global-warming headlines, though often skeptics bring policy agendas of their own. Think tanks backed with funding from the energy industry have waged a wide campaign to cast doubt on key scientific results. "Climate science today is fully politicized," says Roger Pielke Jr., head of the University of Colorado's Center for Science and Technology Policy Research. Mr. McIntyre says he hasn't received any industry funding.

> [Michael Mann]

>

> The hockey stick was a highlight of a 2001 report by the U.N.'s Intergovernmental Panel on Climate Change. That is an advisory body through which the world's scientists try to reach consensus on man-made climate change and provide advice on how to limit it. Because the graph showed only minor temperature changes before the industrial age and then an upward slant -- the hockey-stick shape -- it became an oft-cited argument that human activity was raising temperatures.

>

> The problem, says Mr. McIntyre, is that Dr. Mann's mathematical technique in drawing the graph is prone to generating hockey-stick shapes even when applied to random data. Therefore, he argues, it proves nothing.

>

> Statistician Francis Zwiers of Environment Canada, a government agency, says he now agrees that Dr. Mann's statistical method "preferentially produces hockey sticks when there are none in the data." Dr. Zwiers, chief of the Canadian agency's Center for Climate Modeling and Analysis, says he hasn't had time to study Dr. Mann's rebuttals in detail and can't say who is right.

>

> Dr. Mann, while agreeing that his mathematical method tends to find hockey-stick shapes, says this doesn't mean its results in this case are wrong. Indeed, Dr. Mann says he can create the same shape from the climate data using completely different math techniques.

>

> The dispute turns on esoteric math concepts like principal components analysis, detrended standard deviations and autoregressions. "It's a very difficult technical question, one that not even most people in climate research would understand," says Eduardo Zorita, a climate scientist at the GKSS Research Centre in Germany. He, too, now agrees that Mr. McIntyre has identified a statistical snafu in the hockey-stick math. What he says isn't yet clear is whether it could invalidate Dr. Mann's final result.

>

> Some scientists believe the debate has little bearing on the broad case for man-made warming. That's because, they say, other studies of past temperatures also indicate that the late 20th century was unusually warm. Recent temperature increases also square with the known effects of greenhouse gases. "The main punch line still appears in many other studies," says Jonathan Overpeck, a climate specialist at the University of Arizona. He shares some other scientists' concern that critics have unfairly singled out Dr. Mann's work. A variety of critics appear to be "on some kind of witch hunt," Dr. Overpeck says.

>

> Mr. McIntyre first became interested in the hockey stick in late 2002 after seeing the graph in materials distributed by the Canadian government. "What struck me is that it looked very promotional," he says, "and I wanted to see how they made it." As a financial consultant to small minerals-exploration companies, he was mindful of how wrong estimates of the size of Borneo gold deposits lay behind the 1997 Bre-X Minerals scandal. Mr. McIntyre, who won math contests in high school and a math scholarship to the University of Toronto, says he'd always been disappointed in not having any academic accomplishments "despite having a good mind."

>

> Mr. McIntyre e-mailed Dr. Mann requesting the raw data used to build the hockey stick. After initially providing some information, Dr. Mann cut him off.

>

> Dr. Mann says his busy schedule didn't permit him to respond to "every frivolous note" from nonscientists. The climate-statistics expert, now 39, gained a big career boost from initial publication of the graph in 1998 and 1999. Although others had sought clues to past temperatures, his team was among the first to stitch many disparate records together to span hundreds of years across the entire Northern Hemisphere.

>

> Scientists already knew that average global temperatures had risen about one degree Fahrenheit since 1900. Now the

hockey stick, showing only smaller fluctuations in earlier centuries, was seen as a breakthrough. The IPCC used it to back a striking conclusion: The 1990s were probably the warmest decade in 1,000 years. This conclusion helped shut down skeptics' claim that the 20th century's greater warmth might be due to natural factors such as changes in solar intensity.

>

> Some scientists had doubts, however. The graph gave little emphasis to what's known as the "medieval warm period," the years around 1000 A.D. when the Norse colonized Greenland. It also seemed to smooth over a cold epoch starting in the 15th century called "the little ice age." Others worried that it relied too heavily on growth rings from a small number of ancient trees, such as California bristlecone pines that can live thousands of years clinging to mountainsides.

>

> Some also disliked Dr. Mann's self-confident persuasive style, among them Wallace Broecker of Columbia University's Lamont-Doherty Earth Observatory. Yet because the graph so neatly strengthened the case for man-made warming, Dr. Broecker says, "a lot of people grabbed that hockey stick."

>

> From the outset, the graph was a target of numerous lobbyists and skeptics. When Mr. McIntyre became interested in it, he quickly teamed up with Ross McKittrick, an economist at Canada's University of Guelph who'd written a book questioning global warming. (The two met on an Internet chat group for climate skeptics.) In October 2003, Energy & Environment, a British social-science journal known for contrarian views, published an initial critique by the pair.

>

> The two were invited to Washington as a vote neared on a bill to cap fossil-fuel emissions. They met with Sen. James Inhofe, who heads the environment committee and has called the threat of catastrophic global warming the "greatest hoax ever perpetrated on the American people." The Oklahoma Republican relied on doubts raised by a variety of skeptics in leading successful opposition to the bill in 2003. Mr. McKittrick says he was paid \$1,000 by the Competitive Enterprise Institute, a free-market research and lobbying group, and had his travel costs picked up by another lobby group. Mr. McIntyre, who briefed lobbyists with the National Association of Manufacturers, says he has taken no payment.

>

> Dr. Mann and scientists close to him viewed this as a political attack, not science. Dr. Mann offered a strong rebuttal of the Canadians' 2003 journal article, explaining that it didn't correctly apply his techniques. In doing so, however, he revealed details of his data and mathematical methods that hadn't appeared in his original paper.

>

> When Messrs. McIntyre and McKittrick pointed this out to Nature, the journal that first published the hockey-stick graph, Dr. Mann and his two co-authors had to publish a partial correction. In it, they acknowledged one wrong date and the use of some tree-ring data that hadn't been cited in the original paper, and they offered some new details of the statistical methods. The correction, however, stated that "none of these errors affect our previously published results."

>

> Mr. McIntyre thinks there are more errors but says his audit is limited because he still doesn't know the exact computer code Dr. Mann used to generate the graph. Dr. Mann refuses to release it. "Giving them the algorithm would be giving in to the intimidation tactics that these people are engaged in," he says.

>

> Mainstream scientists have also been scrutinizing the hockey stick. One, Hans von Storch of Germany's GKSS center, has presented theoretical findings arguing that Dr. Mann's technique could sharply underestimate past temperature swings. Indeed, new research from Stockholm University on historical temperatures suggests past fluctuations were nearly twice as great as the hockey stick shows. That could mean the 20th-century jump isn't quite so anomalous.

>

> Dr. von Storch says he faced pressure from colleagues who feared that skeptics could misuse his results. He complains of a tendency in climate science to "use filters and make only comments that are politically correct."

>

> Reports such as his helped to reopen the debate, even to outsiders. And last month, a peer-reviewed journal, Geophysical Research Letters, accepted a paper by Messrs. McIntyre and McKittrick.

>

> The editor, Steve Mackwell, says Dr. Mann contacted him to argue that the Canadians' work was deeply flawed. Dr.

Mann then put a critique on his blog, "Realclimate.org," calling the Canadians' new paper "demonstrably specious." He said the intense criticism of his work struck him as odd because he had always "emphasized...the uncertainties."

>

> Now the IPCC is preparing a new global warming report, due in 2007, and charges of exaggeration are again flying. A U.S. hurricane researcher, Chris Landsea, quit the U.N. body last month after an IPCC senior author, Kevin Trenberth, said storms could get worse because of global warming. Dr. Landsea called that idea unsupported by data and said the IPCC was "motivated by pre-conceived agendas." Dr. Trenberth, defending his analysis, said his critic is the one "politicizing" the science.

>

> As the IPCC revisits the warming issue -- and the hockey stick -- it is taking account of all views, including Mr. McIntyre's, say the group's leaders.

>

> Mr. McIntyre says he intends to continue his audit of climate science and has demanded that other researchers send him details of their work. He isn't satisfied with the responses so far. "When I ask them for additional data, you can imagine how cooperative they are," he says.

>

> Write to Antonio Regalado at [antonio.regalado@wsj.com](mailto:antonio.regalado@wsj.com)

>

---

> Kalee Kreider  
> Washington Office  
> Fenton Communications  
> 1320 18th St. NW 5th Floor  
> Washington, DC 20036  
> 202.822.5200 - office  
> 202.822.4787 - office fax

>

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Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

---

e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: Re: Fwd: cut and pasted versioon  
From: "Michael E. Mann" <[mann@virginia.edu](mailto:mann@virginia.edu)>  
Date: 2/15/05 12:05 PM  
To: Malcolm Hughes <[mhughes@ltr.arizona.edu](mailto:mhughes@ltr.arizona.edu)>

Sure thing Malcolm,

Fortunately, a more complementary account of things appeared in "Scientific American" at precisely the same time. I hope more people see this!

mike

At 09:08 AM 2/15/2005, Malcolm Hughes wrote:

> Thanks Mike, Cheers, Malcolm

>

>

>

---

Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

---

e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Attachments:

SciAmProfileMar05.pdf 132 KB

Subject: Fwd: hockey stick again...

From: "Michael E. Mann" <[mann@virginia.edu](mailto:mann@virginia.edu)>

Date: 2/19/05 12:44 PM

To: Stephen H Schneider <[shs@stanford.edu](mailto:shs@stanford.edu)>, Tom Wigley <[wigley@ucar.edu](mailto:wigley@ucar.edu)>, Ben Santer <[santer1@llnl.gov](mailto:santer1@llnl.gov)>, [mann@virginia.edu](mailto:mann@virginia.edu), [rbradley@geo.umass.edu](mailto:rbradley@geo.umass.edu), [mhughes@ltrr.arizona.edu](mailto:mhughes@ltrr.arizona.edu), [omichael@Princeton.edu](mailto:omichael@Princeton.edu), [jmahlman@ucar.edu](mailto:jmahlman@ucar.edu)

fyi, a response to the WSJ disinformation in easily digestible form...

Mike

> The 'dummies guide' I mentioned to you yesterday is now  
> available at <http://www.realclimate.org/index.php?p=121>  
>  
> I attach a pdf version that might be easier to send around or print.

---

Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

---

e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Attachments:

dummies.pdf 275 KB

Subject: Re: [Fwd: Fw: SSI Alert: USA Today and Climate]

From: "Michael E. Mann" <[mann@virginia.edu](mailto:mann@virginia.edu)>

Date: 6/16/05 5:06 PM

To: Malcolm Hughes <[mhughes@ltrr.arizona.edu](mailto:mhughes@ltrr.arizona.edu)>

p.s. you'll note that I was quoted in Vergano's front page article. I'm sure this spurred on the industry shills (of which Inhofe is perhaps the most pathetic)...

mike

At 07:29 PM 6/16/2005, you wrote:

> Mike - I assume you're aware of this? Malcolm

>

> ----- Original Message -----

> Subject: Fw: SSI Alert: USA Today and Climate  
> Date: Thu, 16 Jun 2005 16:22:28 -0700  
> From: Thomas Swetnam <tswetnam@ltrr.arizona.edu>  
> Reply-To: Thomas Swetnam <tswetnam@ltrr.arizona.edu>  
> To: Malcolm Hughes <mhughes@ltrr.arizona.edu>

> Malcolm,

> See the USA editorial and Inhofe's op ed. He attacks Mike Mann by name again, and the hockey stick.

> Too bad that SSI, in this alert, did not also rebut Inhofe's assertions about the hockey stick.

> Tom

> ----- Original Message ----- From: "SSI Mailbox" <SSI@ucsusa.org>

> Sent: Thursday, June 16, 2005 1:45 PM

> Subject: SSI Alert: USA Today and Climate

> \*\*\*\*\* EXECUTIVE SUMMARY \*\*\*\*\*

> ISSUE: On Monday June 13th, USA Today ran a front-page  
> article titled "The Debate's Over: Globe is Warming" (full  
> text below). The article was followed by two editorials on  
> June 14th. One by USA Today asserting that global warming  
> science is robust and urging action. The other written by  
> Senator James Inhofe (R-OK) cites a lack of scientific  
> evidence for global warming. (links to both editorials below).  
> Now, we understand, USA Today is receiving many  
> letter-to the editor (LTE) submissions in a coordinated  
> effort from those opposed to climate mitigation efforts.

> ACTION: Send in a LTE to USA Today.

> MAIN MESSAGE: The scientific debate on global warming is  
> over and we must now move to take action to reduce heat-  
> trapping gas emissions and thus avoid dangerous levels of  
> climate change.

> DEADLINE: ASAP.

> \*\*\*\*\*

> \*\*\* THE ISSUE \*\*\*

> On Monday, June 13th, The USA Today ran a from page - above  
> the fold -article with the headline: "The debate's over:  
> Globe is warming." The article reported on the strong  
> scientific consensus on the need for action - as most  
> recently depicted in the statement by the US National  
> Academy of Sciences, as well as the growing calls among the

> business and religious communities for federal policy action  
> on the issue. As the most widely read paper in the US, this  
> article reached a wide cross-section of the American public  
> with the clear message on the strong science and need for  
> action on climate change.

>  
> Building upon the 6/13 article, the USA Today ran an  
> editorial on Tuesday, June 14th, questioning the Bush  
> administration's position on climate change -- which the USA  
> Today summarized as: "The science is not yet in to prove a  
> link between man's gas-and-coal guzzling habits and rising  
> global temperatures that are causing glaciers to shrink,  
> polar ice caps to melt and seas to rise" -- by noting that  
> "not only is the science in, it is also overwhelming." The  
> paper called on President Bush to join with other industrial  
> nations at next months G8 meeting in "making global warming  
> a central issue."

>  
> In the same issue, the US Today also ran an op-ed with an  
> opposing viewpoint by Senator James Inhofe (R-OK). In that  
> op-ed, Sen. Inhofe continued to claim that there was not a  
> scientific consensus on climate change. This statement was  
> widely based on his discredited claim of a lack of  
> correlation between atmospheric carbon dioxide  
> concentrations and surface temperature. He also quoted  
> questionable data on the economic impact of efforts to  
> reduce heat-trapping gas emissions.

>  
> You can help readers of the US Today - the nation's most  
> widely read daily newspaper - understand that the USA Today  
> article on climate science got it right: the scientific  
> community is in wide consensus that the Earth is warming and  
> that this warming is, in part, attributable to human  
> activities. Please take a few minutes and draft a letter-to-  
> the-editor of the USA Today. Action is particularly urgent,  
> as opponents of climate change mitigation efforts have  
> organized to target the USA Today with negative letters in  
> response to its front-page article and subsequent editorial

>  
> \*\*\* THE ACTION \*\*\*

>  
> -- Send a letter-to-the-editor to USA Today  
>  
> Legislative and administrative offices systematically review  
> the letters-to-the-editor section. Even a short letter  
> published there plays a critical dual role - showing  
> officials that their constituents believe climate change is  
> an important issue as well as educating the public on global  
> warming.

>  
> The online form to submit an LTE to USA Today can be found  
> at  
> < <http://asp.usatoday.com/marketing/feedback/feedback-online.aspx?type=18> >

>

> To increase the chances that your letter will be published,  
> do the following:  
>  
> -- keep it under 200 words  
> -- stay focused on one or two main points you'd like to  
> make;  
> -- mention your scientific expertise on this issue;  
> -- include your name, address, and daytime phone number; the  
> paper will contact you before printing your letter; and  
>  
> \*\*\*\*\*  
>  
> -- TIMING: Your LTE should reach your paper by tomorrow  
> (Fri) to increase the chances of it being published.  
>  
> -- MAIN MESSAGE: The scientific debate on global warming is  
> over and we must now move to take action to reduce heat-  
> trapping gas emissions and thus avoid dangerous levels of  
> climate change.  
>  
> NOTE: Please send us an email message that tells us what  
> action you took. If you actually send a letter, please send  
> us a copy. Send to: ssi@ucsusa.org or UCS, 2 Brattle  
> Square, Cambridge, MA 02238-9105 (attn. Jason Mathers).  
>  
> \*\*\* SUPPLEMENTAL INFORMATION \*\*\*  
>  
> -- USA Today editorial  
> < [http://www.usatoday.com/news/opinion/editorials/2005-06-14-our-view\\_x.htm](http://www.usatoday.com/news/opinion/editorials/2005-06-14-our-view_x.htm)  
>  
> -- Senator Inhofe op-ed  
> < [http://www.usatoday.com/news/opinion/editorials/2005-06-14-oppose\\_x.htm](http://www.usatoday.com/news/opinion/editorials/2005-06-14-oppose_x.htm) >  
>  
> Science Academies: Global response to climate change  
> < <http://nationalacademies.org/onpi/06072005.pdf> >  
>  
> US National Academy of Sciences  
> < <http://www4.nationalacademies.org/nas/nashome.nsf> >  
>  
> Official web site of the upcoming G8 meeting  
> < <http://www.g8.gov.uk> >  
>  
>  
> \*\*\*\*\*  
> USA Today  
> June 12, 2005  
>  
> The debate's over: Globe is warming  
>  
> By Dan Vergano, USA TODAY  
>  
> Don't look now, but the ground has shifted on global  
> warming. After decades of debate over whether the planet is  
> heating and, if so, whose fault it is, divergent groups are

- > joining hands with little fanfare to deal with a problem
- > they say people can no longer avoid.
- >
- > General Electric is the latest big corporate convert;
- > politicians at the state and national level are looking for
- > solutions; and religious groups are taking philosophical and
- > financial stands to slow the progression of climate change.
- >
- > They agree that the problem is real. A recent study led by
- > James Hansen of the NASA Goddard Institute for Space Studies
- > confirms that, because of carbon dioxide emissions and other
- > greenhouse gases, Earth is trapping more energy from the sun
- > than it is releasing back into space.
- >
- > The U.N. International Panel on Climate Change (IPCC)
- > estimates that global temperatures will rise 2 to 10 degrees
- > by 2100. A "middle of the road" projection is for an average
- > 5-degree increase by the end of the century, says Caspar
- > Amman of the National Center for Atmospheric Research in
- > Boulder, Colo.
- >
- > What the various factions don't necessarily agree on is what
- > to do about it. The heart of the discussion is "really about
- > how to deal with climate change, not whether it's
- > happening," says energy technology expert James Dooley of
- > the Battelle Joint Global Change Research Institute in
- > College Park, Md. "What are my company's options for
- > reducing greenhouse gas emissions? Are there new business
- > opportunities associated with addressing climate change?
- > Those are the questions many businesses are asking today."
- > The players
- >
- > GE Chairman Jeffrey Immelt recently announced that his
- > company, which reports \$135 billion in annual revenue, will
- > spend \$1.5 billion a year to research conservation,
- > pollution and the emission of greenhouse gases. Joining him
- > for the announcement were executives from such mainline
- > corporations as American Electric Power, Boeing and Cinergy.
- >
- > Religious groups, such as the United States Catholic
- > Conference of Bishops, National Association of Evangelicals
- > and National Council of Churches, have joined with
- > scientists to call for action on climate change under the
- > National Religious Partnership for the Environment. "Global
- > warming is a universal moral challenge," the partnership's
- > statement says.
- >
- > And high-profile politicians from both parties are getting
- > into the act. For example, California Gov. Arnold
- > Schwarzenegger has called for a reduction of more than 80%
- > over the next five decades in his state's emission of
- > greenhouse gases that heat in the atmosphere.
- >
- > To be sure, many companies - most notably oil industry

> leader ExxonMobil - still express skepticism about the  
> effects of global warming. And the Bush administration has  
> supported research and voluntary initiatives but has pulled  
> back from a multi-nation pact on environmental constraints.  
>  
> The administration was on the defensive last week when The  
> New York Times reported that a staff lawyer has been  
> softening scientific assessments of global warming. White  
> House spokesman Scott McClellan defended such action as a  
> routine part of a multi-agency review process.  
>  
> Nonetheless, the tides of change appear to be moving on.  
>  
> "As big companies fall off the 'I don't believe in climate  
> change' bandwagon, people will start to take this more  
> seriously," says environmental scientist Don Kennedy, editor  
> in chief of the journal Science. Companies aren't changing  
> because of a sudden love for the environment, Kennedy says,  
> but because they see change as an opportunity to protect  
> their investments.  
>  
> "On the business side, it just looks like climate change is  
> not going away," says Kevin Leahy of Cinergy, a Cincinnati-  
> based utility that reports \$4.7 billion in annual revenue  
> and provides electricity, mostly generated from coal, to 1.5  
> million customers. Most firms see global warming as a  
> problem whose risks have to be managed, he says.  
>  
> Power companies want to know what sort of carbon constraints  
> they face - carbon dioxide is the chief greenhouse gas - so  
> they can plan long term and avoid being hit with dramatic  
> emission limits or penalties in the future, he says.  
>  
> Science and solutions  
>  
> Climate scientists say this acceptance comes none too soon.  
> "All the time we should have been moving forward ... has  
> been wasted by arguing if the problem even exists," says  
> Michael Mann of the University of Virginia.  
>  
> The IPCC estimates that rainfall will increase up to 20% in  
> wet regions, causing floods, while decreasing 20% in arid  
> areas, causing droughts. The Environmental Protection Agency  
> says melting glaciers and warmer ocean waters will likely  
> cause an average 2-foot rise in sea level on all U.S. coasts  
> by 2100.  
>  
> Carbon dioxide is the byproduct of burning fossil fuels such  
> as coal, natural gas or oil. There are now about 1 trillion  
> tons of carbon from carbon dioxide in the atmosphere. By the  
> end of the century, atmospheric carbon projections range  
> from 1.2 trillion tons if stringent corrective steps are  
> taken to 2.8 trillion tons if little is done.  
>

- > Moving ahead with solutions looks like the hardest part of
- > the equation for the United States. The Bush
- > administration's stance has frustrated advocates of a more
- > aggressive response.
- >
- > Bush explained in a 2001 speech why he opposed joining the
- > Kyoto Protocol, a global agreement to curb greenhouse gases:
- > "The (Kyoto) targets themselves were arbitrary and not based
- > upon science. For America, complying with those mandates
- > would have a negative economic impact, with layoffs of
- > workers and price increases."
- >
- > Instead, the administration "harnesses the power of markets
- > and technological innovation, maintains economic growth, and
- > encourages global participation," former Energy Department
- > head Spencer Abraham wrote last year in Science. He pointed
- > to tax incentive programs, climate research and technologies
- > such as "FutureGen," the Energy Department's 10-year,\$1
- > billion attempt at creating a coal-fired power plant that
- > emits no greenhouse gases.
- >
- > Other administration efforts:
- >
- > \*The \$1.7 billion hydrogen fuel-cell car initiative
- > announced two years ago in Bush's State of the Union
- > address.
- >
- > \*A \$49 million carbon "sequestration" initiative with 65
- > projects to see whether carbon dioxide can be stripped from
- > emissions.
- >
- > \*Participation in the international ITER program to develop
- > nuclear fusion as an energy source.
- >
- > The administration has encouraged voluntary efforts.
- > Fourteen trade groups representing industrial, energy,
- > transportation and forest companies have signed up for a
- > program aimed at cutting greenhouse-gas emissions 18% by
- > 2012.
- >
- > So why isn't this enough to assuage critics?
- >
- > Rick Piltz, a science policy expert who resigned in protest
- > from the administration's Climate Change Science Program in
- > March, says the reliance on voluntary measures and long-term
- > technology breakthroughs is a roadblock against simple
- > conservation steps that could curb emissions now. Piltz
- > provided the edited documents that were the subject of last
- > week's story in The New York Times.
- >
- > Commonly cited examples of the conservation steps Piltz
- > mentions:
- >
- > \*Incentives for emission controls on the oldest and least

- > efficient power plants.
- >
- > \*More stringent mileage and tailpipe requirements on vehicles.
- >
- > \*Expanded tax credits for more efficient air conditioners, hybrid cars and appliances.
- >
- > Political leaders will support such measures only if the benefits come at a low cost to the economy, says William Reilly, co-chair of the bipartisan National Commission on Energy Policy and former head of the EPA under President George H.W. Bush. "But there is a lot going on, and I think we will be seeing some movement on this."
- >
- > Away from the political arena, other irons are in the fire:
- >
- > \*More people are advocating nuclear power. Greenpeace co-founder Patrick Moore told a congressional panel in April that "nuclear energy is the only non-greenhouse gas-emitting energy source that can effectively replace fossil fuels and satisfy global demand."
- >
- > \*Immelt called for the United States to adopt an emissions-trading plan for greenhouse gases. Taking a cue from the EPA's policy of having companies buy and sell permits to release sulfur dioxide, which is responsible for acid rain, economists suggest that such a scheme would limit carbon dioxide by making emissions economically less feasible. In Congress, the Climate Stewardship Act proposed by Sens. Joseph Lieberman, D-Conn., and John McCain, R-Ariz., would commit the country to such a plan.
- >
- > No 'silver bullet' solution
- >
- > Pressure for reforms may come most strongly from "socially responsible" investors. "We make bottom-line arguments to companies to make decisions in the interests of their shareholders," says John Wilson of Christian Brothers Investment Services, which manages \$3.5 billion in investor funds. The firm advises 1,000 Catholic institutions, such as churches, schools and hospitals.
- >
- > A Christian Brothers resolution in May asked ExxonMobil "to explain the scientific basis for its ongoing denial of the broad scientific consensus that the burning of fossil fuels contributes to global climate change." The resolution garnered 10.3% of shareholders' votes, representing 665 million shares worth more than \$36 billion, despite the opposition of management.
- >
- > "The future of energy is plainly moving away from fossil fuels and we want the companies (that) we invest in to explain how they plan to adjust," Wilson says.

>  
> Dooley, of the Battelle Institute, says: "We need a whole  
> series of 'home runs' and maybe even a couple of 'grand  
> slams' to successfully address this problem. More efficient  
> refrigerators, better and cheaper solar cells, hybrid  
> automobiles, fuel cells, power plants that capture and store  
> their (carbon dioxide) deep below the surface and nuclear  
> power. They all have important roles to play."

>  
> "No one seriously talks about trying to address climate  
> change with one technology," Dooley says. "Everyone  
> understands that there isn't a 'silver bullet' out there  
> waiting to be discovered."

>  
>  
> \*\*\*\*\*  
> NOTE: Please send us an email message that tells us what  
> action you took. If you actually send a letter, please send  
> us a "blind copy." (A blind copy simply means that you do  
> not indicate anywhere on your letter that you are sending a  
> copy to us.) Send to: ssi@ucsusa.org or UCS, 2 Brattle  
> Square, Cambridge, MA 02238-9105 (attn. Jason Mathers).

>  
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> or concerns about this or any SSI email, contact Jason  
> Mathers, GEP Outreach Specialist, via email at  
> ssi@ucsusa.org, by phone at [REDACTED] or by postal mail  
> to Union of Concerned Scientists, Two Brattle Square,  
> Cambridge, MA 02238

>  
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> or send an email to Jason Mathers at ssi@ucsusa.org

>  
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e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: Re: EGS abstract  
From: Malcolm Hughes <mhughes@lrr.arizona.edu>  
Date: 11/30/99 2:06 PM  
To: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>

Mike - the abstract looks fine to me. WHEN do you leave for San Francisco? CHEers, Malcolm

Subject: Re: Barnett  
From: Malcolm Hughes <mhughes@lrr.arizona.edu>  
Date: 12/3/99 3:11 PM  
To: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>

Mike - I'll only be at AGU 2 nights. I get in to SFO at 7.30 Monday evening, so maybe we could meet that evening. I leave Wednesday afternoon, and will be involved in a party for Roger Barry for at least the first part of Tuesday evening. When's good for you? Cheers, Malcolm

Subject: Re: piece  
From: Malcolm Hughes <mhughes@ltrr.arizona.edu>  
Date: 12/6/99 3:26 PM  
To: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>

Mike - a) I'll be checking into the SF Marriott close to 9 on Monday evening - might this be too late to get together?  
b) I've foolishly let go of my last reprint of the GRL paper - do you have another one you could put in the mail so I can make copies?  
Thanks, Malcolm

Subject: Re: piece  
From: Malcolm Hughes <mhughes@ltrr.arizona.edu>  
Date: 12/7/99 12:00 PM  
To: "Michael E. Mann" <mann@virginia.edu>

Mike - next week will be fine, Cheers, Malcolm

Subject: Re: PACLIM  
From: Malcolm Hughes <mhughes@ltrr.arizona.edu>  
Date: 1/6/00 3:19 PM  
To: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>

Mike - there's a major panic going on right now about the clash between the two meetings. It may be that PACLIM has to change its theme. More anon, Malcolm

Subject: Harvey  
From: Malcolm Hughes <mhughes@lrr.arizona.edu>  
Date: 1/11/00 9:56 AM  
To: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>

Mike - do you know when the Harvey Weiss edited volume is coming out and what are the details? Malcolm

Subject: Re: Harvey  
From: Malcolm Hughes <mhughes@lrr.arizona.edu>  
Date: 1/11/00 1:05 PM  
To: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>

Dear Mike - yes, I was referring to the special issue, and apologies for having got the editorship wrong. I was asking because a grad student here is doing an independent study on NAO and the mid-east. Cheers, Malcolm

Subject: Re: Janice Lough, volcanoes and ENSO  
From: Malcolm Hughes <mhughes@ltrr.arizona.edu>  
Date: 1/11/00 1:29 PM  
To: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>

Mike - here are the references, Malcolm  
Lough, J. M. 1992: Climate of 1816 and 1811-1820  
As Reconstructed From Western North America  
Tree-Ring Chronologies. The Year Without  
Summer? World Climate in 1816, C. R.  
Harrington, 97-114. Ottawa, Ontario, Canada:  
Canadian Museum of Nature.  
Lough, J. M. Fritts H. C. 1987. An Assessment of  
the Possible Effects of Volcanic Eruptions on  
North American Climate Using Tree-Ring Data,  
1602 to 1900 A.D. Climatic Change: 219-39.  
Lough, J. M., and H. C. Fritts. 1985. The Southern  
Oscillation and Tree-Rings: 1660-1961. Journal  
of Climate and Applied Meteorology 24, no. 9:  
952-65.

Subject: Re: workshop  
From: Malcolm Hughes <mhughes@ltrr.arizona.edu>  
Date: 2/26/00 6:38 AM  
To: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>

Mike - you bet, and not just because of the location - good topic for the timing, Many thanks, Malcolm

Subject: Re: Fwd: TAR 1000-year temperature record.  
From: Malcolm Hughes <mhughes@ltrr.arizona.edu>  
Date: 4/20/00 10:26 AM  
To: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>

Dear Mike - I forgot to add that it's clear from the questions that they haven't even read the papers they seek to debunk (viz. ours)!

Cheers, Malcolm

Subject: Re: getting together  
From: Malcolm Hughes <mhughes@lrr.arizona.edu>  
Date: 8/8/00 11:52 AM  
To: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>  
CC: srutherford@virginia.edu

Dear Mike - I'm around at all of those times. A reminder of my phone number:

home (until end of August) XXX XXX XXXX

Harvard Forest 978-724-3302 ext. 255

cell XXX-XXX-XXXX

The home number is the most reliable one touse, with the voice mail that works. Cheers, Malcolm

Subject: Re: getting together  
From: Malcolm Hughes <mhughes@lrr.arizona.edu>  
Date: 8/8/00 12:56 PM  
To: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>

Mike - I probably need to be at Harvard Forest Friday a.m. if poss,  
so early afternoon would be better, Cheers, Malcolm

Subject: Re: getting together  
From: Malcolm Hughes <mhughes@lrr.arizona.edu>  
Date: 8/8/00 1:37 PM  
To: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>

Mike - OK - Rao's? Malcolm

**Subject:** OGP announcement

**From:** Malcolm Hughes <mhughes@ltrr.arizona.edu>

**Date:** 8/31/00 2:53 PM

**To:** Michael E. Mann <mann@multiproxy.evsc.virginia.edu>, Raymond S. Bradley <rbradley@geo.umass.edu>

Gentlemen - direct from Mark Eakin, please find attached this year's OGP announcement. Cheers, Malcolm

**Attachments:**

C:\Projects\Bradley and Mann\2000 project\ogpfedreg01.pdf

Subject: EI article

From: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>

Date: 11/15/00 10:38 AM

To: mhughes@ltrr.arizona.edu, rbradley@geo.umass.edu, jto@u.arizona.edu

Dear All,

The EI article should appear up on the EI site any day now (with a link to the url for the interactive version). My best approximation to the proper reference for the paper is:

Mann, M.E., Gille, E., Bradley, R.S., Hughes, M.K., Overpeck, J.T., Keimig, F.T., Gross, W. (2000) Global Temperature Patterns in Past Centuries: An interactive presentation, Earth Interactions, 4-4, 1-29, 2000.

which means, its the 4th paper in the 4th volume, and the frozen (pdf) version of it is 29 pages in length.

I've attached the final pdf version as provided by the EI people

cheers,

mike

---

Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

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e-mail: mann@virginia.edu Phone: (804) 924-7770 FAX: (804) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.html>

Attachments:

eint\_vol4\_0004\_1\_29\_2.pdf 1.5 MB



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<http://EarthInteractions.org>

## Global Temperature Patterns in Past Centuries: An Interactive Presentation

**Michael E. Mann,<sup>\*,&</sup> Ed Gille,<sup>+</sup> Raymond S. Bradley,<sup>#</sup>  
Malcolm K. Hughes,<sup>@</sup> Jonathan Overpeck,<sup>+</sup> Frank T.  
Keimig,<sup>#</sup> and Wendy Gross<sup>+</sup>**

\* Department of Environmental Sciences, University of Virginia, Charlottesville, Virginia

+ NOAA Paleoclimatology Program, Boulder, Colorado

# Department of Geosciences, University of Massachusetts, Amherst, Massachusetts

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Received 11 May 1999; accepted 31 May 2000. (in final form 15 June 2000)

**ABSTRACT:** The recent availability of global networks of annual or seasonal resolution proxy data, combined with the few long instrumental and historical climate records available during the past few centuries, make it possible now to reconstruct annual and seasonal spatial patterns of temperature variation, as well as hemispheric, global-mean, and regional temperature trends, several centuries back in time.

Reconstructions of large-scale global or hemispheric trends during centuries past can place the instrumental assessments of climate during the twentieth century in a longer-term perspective and provide more robust evidence regarding the roles of potential climate forcings over time. The reconstructed

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E-mail address: [mann@virginia.edu](mailto:mann@virginia.edu)

spatial patterns lead to important inferences regarding ENSO-scale variability, the spatial influences of climatic forcings, and the regional patterns that underlie large-scale climate variations. Here proxy-based annual global temperature pattern reconstructions described recently by Mann et al. are expanded upon. For the first time seasonally resolved versions of the proxy-reconstructed surface temperature patterns are presented, and the seasonal differences between key climate indices and patterns of variations are diagnosed. The reader is enabled to interactively examine spatial as well as temporal details (and their uncertainties) of yearly temperatures back in time for both annual-mean and seasonal windows. Annual and seasonal time histories of reconstructed Northern Hemisphere, Southern Hemisphere, and global-mean temperature are made available, as are time histories of the Niño-3 index describing El Niño-related variations, time histories for particular regions of interest such as North America and Europe, and time series for temperature variations in different (e.g., tropical and extratropical) latitude bands. Time histories for specific grid points are available along with their estimated uncertainties. Time histories for the different eigenvectors [i.e., the reconstructed principal components (RPCs)] are also available, along with the raw instrumental series, which underlie the temperature pattern reconstructions. For both the annual-mean and seasonally resolved temperature reconstructions, the reader can directly compare reconstructed patterns for different years, as well as the raw and reconstructed patterns during calibration and verification intervals, and view animated year-by-year sequences of reconstructed global temperature patterns. The statistical relationships between climate forcings and temperature variations are also analyzed in more detail, taking into account potential lagged responses to climate forcings in empirical attribution analyses.

**KEYWORDS:** Global change; Solar variability; Paleoclimatology; Climate and interannual variability; El Niño

## 1. Introduction

In order to gauge just how unusual climate trends during the twentieth century truly are, and what the likely causative agents influencing these trends may be, we must rely on indirect lines of evidence to provide a broader context of past climate changes. For assessing some of the broad long-term trends, the history of mountain glacier fluctuations (Grove and Switsur, 1994) and geothermal, borehole-based estimates of past ground temperature (Pollack et al., 1998) can provide important information on climate changes during past centuries. For assessing a year-by-year or even decade-by-decade chronology of such climate changes, however, we must rely upon high-resolution “proxy” climate indicators—natural archives that record seasonal or annual climate conditions such as ice cores, tree-ring measurements, laminated sediments, and corals—combined with the scant available historical documentary or instrumental evidence available in prior centuries.

Increasingly, studies based on the assimilation and analysis of such global “multiproxy” networks of high-resolution proxy climate data have proven useful for assessing global or hemispheric patterns of climate in past centuries (e.g.,

Bradley and Jones, 1993; Hughes and Diaz, 1994; Lean et al., 1995; Mann et al., 1995; Jones et al., 1998; Crowley and Lowery, 2000) and reconstructing climate trends in particularly sensitive, high-latitude regions (Overpeck et al., 1997; Briffa et al., 1998). Such studies have been spurred by hopes to better constrain the influences of natural and anthropogenic factors on long-term climate variability and change (Lean et al., 1995; Overpeck et al., 1997; Mann et al., 1998), to estimate climate sensitivity to external radiative forcing (Crowley and Kim, 1999; Waple et al., 2000), and to validate the behavior of climate models on multidecadal and longer timescales (Barnett et al., 1996; Jones et al., 1998; Delworth and Mann, 2000).

Most recently, global multiproxy climate data have been used to calibrate global-scale patterns of temperature on a yearly basis, several centuries in time by Mann et al. (Mann et al., 1998). The reliability of these reconstructions was demonstrated by cross-validation with independent data, and uncertainties back in time were assessed. These reconstructions have since been extended to estimate Northern Hemisphere (NH) temperature variations over the past millennium (Mann et al., 1999), to examine ENSO-scale patterns of climate variability during past centuries (Mann et al., 2000), to compare observed patterns of variability in the Atlantic with natural coupled ocean-atmosphere modes evident in long climate model integrations (Delworth and Mann, 2000), and to assess the relationship between global patterns of climate variation and particular regional patterns such as the North Atlantic oscillation (NAO) (Mann, 2000; Cullen et al., 2000). Here we further expand on the results of the Mann et al. (Mann et al., 1998) study. We make available for the first time seasonally resolved versions global surface temperature patterns based on the data and methods described in that study. These reconstructions, as well as the original annual-mean reconstructions of Mann et al. (Mann et al., 1998), are made available in a “user friendly” interactive forum, allowing readers to select the particular spatial regions and time periods of particular interest. We also examine in greater detail than before issues related to the sensitivity of the climate reconstructions to varying networks of proxy data, the regional and latitudinal details of past climate variability, and the detection of natural and anthropogenic influences on past temperature changes. We encourage readers to investigate the details of the temperature reconstructions themselves through an interactive graphical user interface. It is our intent here to provide information about past climate changes for consumption by a broad, multidisciplinary readership. Details regarding regional variations, verification or “cross-validation,” and uncertainties inherent in the reconstructions are stressed, so as to encourage a prudent interpretation of proxy-based estimates of past climate changes.

## **2. Review of data and methods**

Details about the data and methods used are provided by Mann et al. (Mann et al., 1998; Mann et al., 1999). The most important aspects of the data and methods used in that study are summarized here for the benefit of the reader. In Figure 1 we show the distribution of proxy and long instrumental data that compose the multiproxy network used by Mann et al. (Mann et al., 1998).

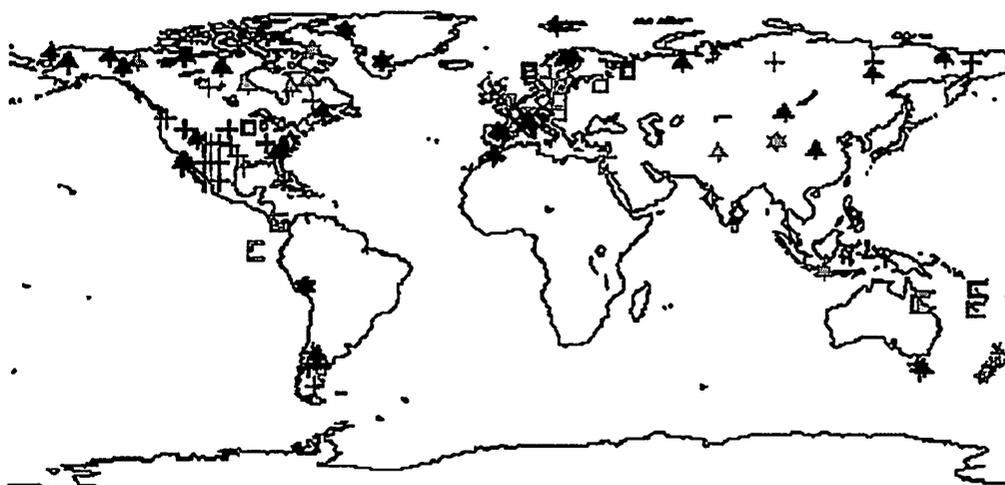


Figure 1. Distribution of annual resolution proxy indicators used in this study. Dendroclimatic reconstructions are indicated by tree symbols, ice core/ice melt proxies by star symbols, and coral records by C symbols. Long historical records and instrumental "gridpoint" series are shown by squares (temperature), or diamonds (precipitation). Groups of plus (+) symbols indicate principal components of dense tree-ring subnetworks, with the number of such symbols indicating the number of retained principal components. Sites are shown dating back to at least 1820 (red), 1800 (blue-green), 1750 (green), 1600 (blue), and 1400 (black). Certain sites (e.g., the Quelccaya ice core) consist of multiple proxy indicators (e.g., multiple cores, and both oxygen isotope and accumulation measurements). [Reprinted with permission from Mann et al. (Mann et al. 1998).]

These data were calibrated (see details in Mann et al., 1998) by the instrumental surface temperature data (Figure 2) available during the twentieth century, based on a multivariate regression of the proxy data network against the primary eigenvectors of the monthly global instrumental temperature data (Figure 3) to yield a statistical relationship that would allow the projection of temperature patterns on a year-by-year basis, preceding the twentieth century (1902–80) period of widespread instrumental data. The spatial temperature patterns were determined by summing over the reconstructed histories of the retained eigenvectors RPCs. The reader is referred to Mann et al. (Mann et al., 1998) for details regarding the calibration process. In the present study, the entire procedure has been repeated for two distinct half-year seasons: the boreal warm season/austral cold season (Apr–Sep) and the boreal cold season/austral warm season (Oct–Mar). [Note: It is our convention to reference the boreal cold season reconstructions to the year corresponding to Jan–Mar rather than Oct–Dec. This differs by 1 yr from certain other conventions (e.g., the typical convention for referring to winter-mean Southern Oscillation index (SOI) and should be kept in mind in making comparisons with other winter climate indices.] The results of the temperature pattern calibra-

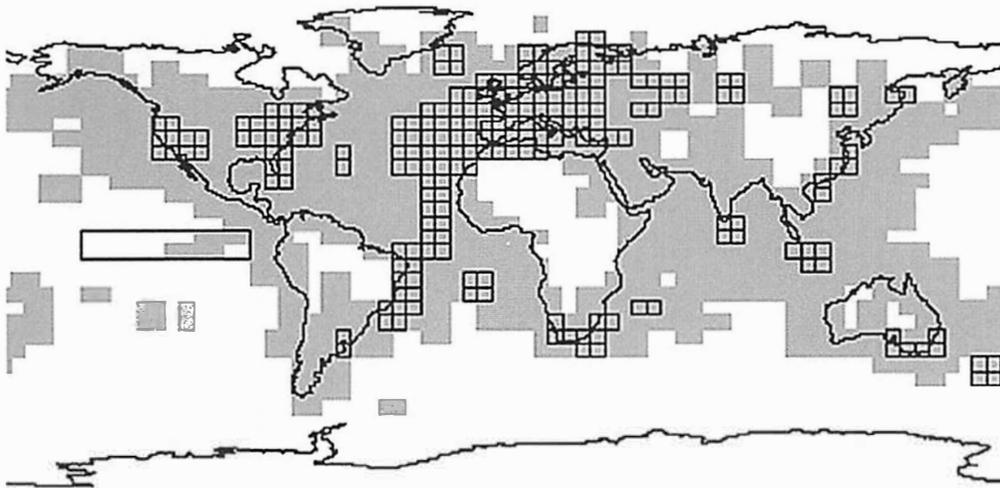


Figure 2. Distribution of the (1082) nearly continuous available monthly land air-sea surface temperature gridpoint data available from 1902 onward indicated by shading. The squares indicate the subset of 219 grid points with nearly continuous records extending back to 1854 that are used for verification. Northern Hemisphere (NH) and global (GLB) mean temperature are estimated as areally weighted (i.e., cosine latitude) averages over the Northern Hemisphere and global domains, respectively. The large rectangle indicates the tropical Pacific SST subdomain discussed in the text. The small rectangle in the eastern tropical Pacific shows the traditional Niño-3 region. These data are described in more detail by Jones (Jones, 1994). [Initial comparisons using an updated version of this dataset (e.g., Jones et al., 1999) showed no significant differences in the large-scale structure of the twentieth century surface temperature dataset, although some specific differences are notable, particularly during the World War II years (e.g., the mid-1940s). Future updates of these reconstructions will employ this latter instrumental surface temperature dataset.] [Reprinted with permission from Mann et al. (Mann et al. 1998).]

tions for both the annual-mean reconstructions of Mann et al. (Mann et al., 1998) and the more recent seasonal (boreal cold and warm half-year) reconstructions are provided for the reader.

The validity of the annual-mean reconstructions was demonstrated based on a series of statistical cross-validation or “verification” experiments. In these experiments, the reconstructions based on the calibration of twentieth century instrumental data were compared against withheld instrumental data, including those available on a large-scale basis during the latter half of the nineteenth century (see Figure 4), and sparser data available in certain regions (e.g., Europe and North America) several centuries back in time. The reader is referred to Mann et al. (Mann et al., 1998) for details of these experiments. We provide here the

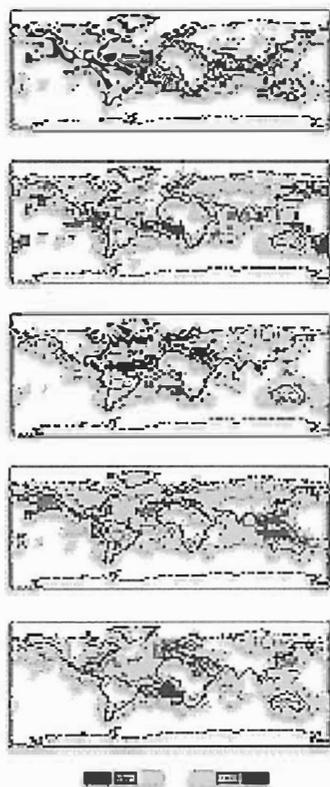


Figure 3. Empirical orthogonal functions (EOFs) for the five leading eigenvectors of the global temperature data from 1902 to 1993. [Reprinted with permission from Mann et al. (Mann et al. 1998).]

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actual statistical results from the verification experiments for the annual mean, cold season, and warm season. (The results are available online: annual, <http://www.ngdc.noaa.gov/paleo/ci/stats-supp-annual.html>; cold season, <http://www.ngdc.noaa.gov/paleo/ci/stats-supp-cold.html>; warm season, <http://www.ngdc.noaa.gov/paleo/ci/stats-supp-warm.html>.) The reconstructions have been demonstrated to be unbiased back in time, as the uncalibrated variance during the twentieth century calibration period was shown to be consistent with a normal distribution (Figure 5) and with a white noise spectrum. Unbiased self-consistent estimates of the uncertainties in the reconstructions were consequently available based on the residual variance uncalibrated by increasingly sparse multiproxy networks back in time. [This was shown to hold up for reconstructions back to about 1600. For reconstructions farther back in time, Mann et al. (Mann et al., 1999) show that the spectrum of the calibration residuals is somewhat more “red,” and more care needs to be taken in estimating the considerably expanded uncertainties farther back in time.]

These various internal consistency checks and verification experiments, to-

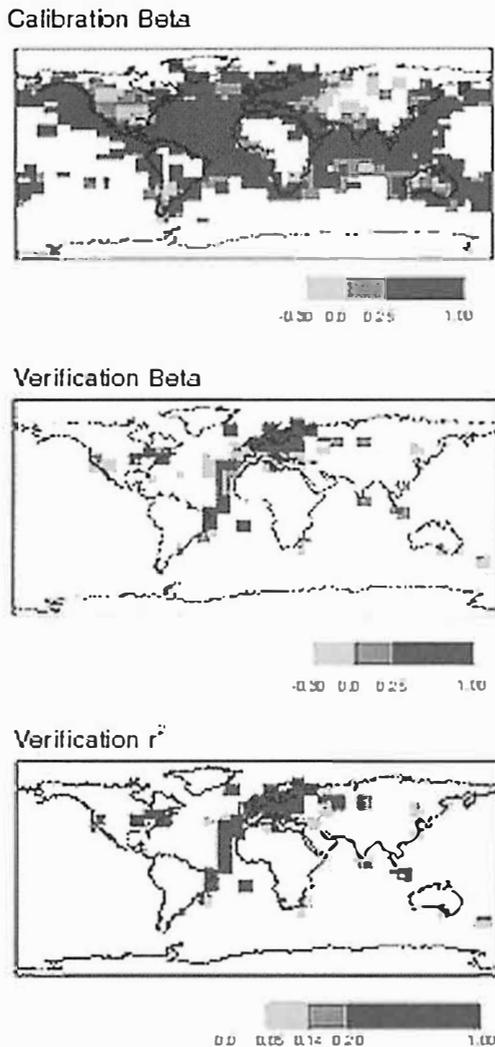


Figure 4. Spatial patterns of (top) calibration beta, (middle) verification beta, and (bottom)  $r$ -squared statistics for annual-mean reconstructions. The calibration statistics are based on the 1902–80 data, while the verification statistics are based on the sparser 1854–1901 instrumental data (see Figure 2) withheld from calibration. For the beta statistic, values that are insignificant at the 99% level are shown in gray, while negative, but 99% significant values are shown in yellow, and significant positive values are shown in two shades of red. For the  $r$ -squared statistic, statistically insignificant values (or any grid points with unphysical negative values of correlation) are indicated in gray. The color scale indicates values significant at the 90% (yellow), 99% (light red), and 99.9% (dark red) levels (these significance levels are slightly higher for the calibration statistics that are based on a longer period of time). More details regarding significance level estimation are provided in Mann et al. (Mann et al., 1998). [Reprinted with permission from Mann et al. (Mann et al., 1998).]

## DISTRIBUTION OF CALIBRATION RESIDUALS

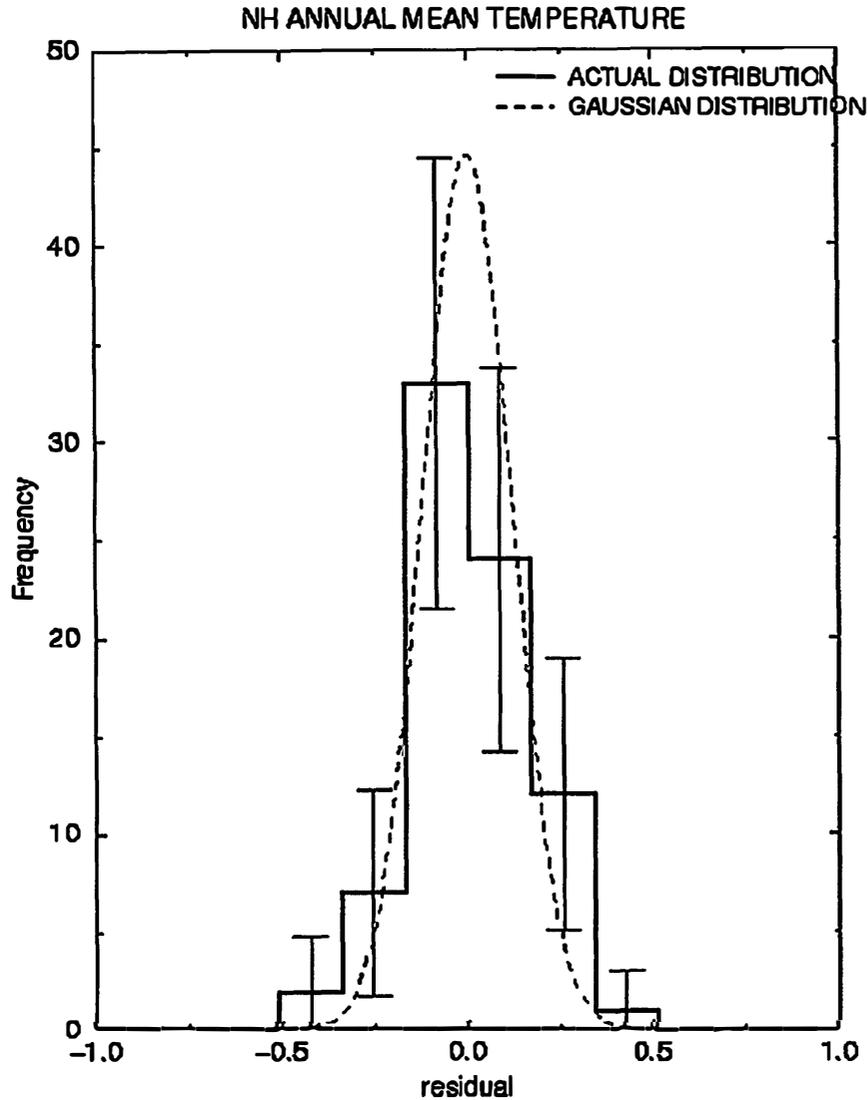


Figure 5. Histogram of calibration residuals for annual-mean NH series. A Gaussian parent distribution is shown for comparison, along with the  $\pm 2$  standard error bars for the frequencies of each bin. The distributions are consistent with a Gaussian distribution at a high (95%) level of confidence. The distribution of residuals for the Niño-3 index (not shown) is consistent with a Gaussian distribution at a 99% level of confidence.

gether, indicate that skillful and unbiased reconstructions are possible several centuries back in time, both for the annual mean and independent cold and warm seasons. However, the reader will note that a considerably smaller fraction of the instrumental variance is calibrated in the seasonal reconstructions (particularly the warm season) than in the annual-mean reconstructions. We attribute this to the constructive mutual seasonal information in the diverse network of proxy data used, which allows more effective reconstruction of annual-mean conditions than particular seasonal conditions. The uncertainties are thus considerably greater for the seasonal reconstructions. Moreover, the annual-mean reconstructions are not equivalent to the sum of the cold-season and warm-season reconstructions since the substantially greater uncertainties in the latter add in quadrature, rather than canceling, in a numerical average. For example, the amplitude of the NH series variations in past centuries is similarly underestimated for both warm and cold seasons, and the average of the two is a considerable underestimate of the annual-mean reconstruction. For these reasons, the quantitative details of these latter reconstructions should be interpreted quite cautiously, although the qualitative insights afforded by the seasonally resolved versions of the reconstructions are useful.

Owing to the decreased number of spatial degrees of freedom in the earliest reconstructions (associated with significantly decreased calibrated variance before, e.g., 1730 for annual-mean and cold-season pattern reconstructions, and about 1750 for warm-season pattern reconstructions) regional inferences are most meaningful in the mid-eighteenth century and later, while the largest-scale averages are useful farther back in time. For example, the NH annual-mean temperature series appears to exhibit skill back to at least A.D. 1400 [and has now been extended back to A.D. 1000 by Mann et al. (Mann et al., 1999), albeit with expanded uncertainty estimates]. We have also verified that possible low-frequency bias due to nonclimatic influences on dendroclimatic (tree ring) indicators is not problematic in our temperature reconstructions. (A note on possible non-climatic tree-ring trend bias is available online: [http://www.ngdc.noaa.gov/paleo/ei/ei\\_nodendro.html](http://www.ngdc.noaa.gov/paleo/ei/ei_nodendro.html).)

A Niño-3 SST index, describing El Niño-related variability, can be calculated in the eastern tropical Pacific directly from these reconstructions (i.e., by averaging the global reconstructions over the Niño-3 rectangular region defined in Figure 2). The Niño-3 reconstructions are also discussed in more detail in the next section.

### **3. Temperature reconstructions**

In this section, we describe, present, and interpret the annual and seasonal temperature reconstructions, associated uncertainties, and raw data used in calibration and verification.

#### **3.1. Large-scale trends**

The reconstructed annual Northern Hemisphere mean temperature series is shown in Figure 6. Based on this reconstruction, Mann et al. (Mann et al., 1998) argued

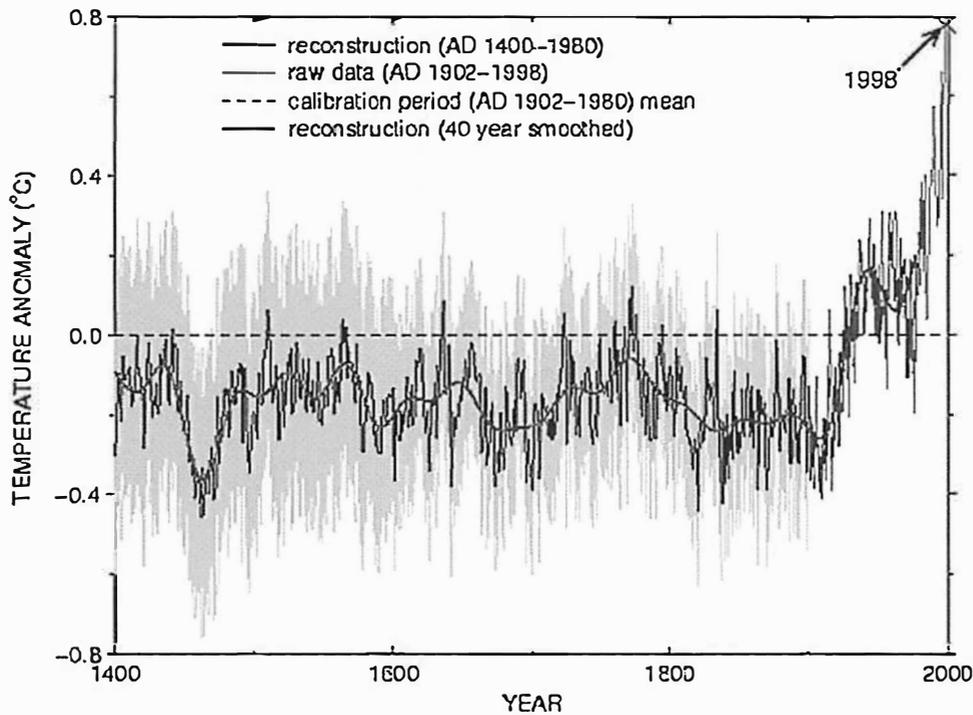


Figure 6. Northern Hemisphere mean temperature reconstruction from A.D. 1400–1980, shown with raw instrumental NH series (red) through 1998. The low-frequency trend (timescales longer than 40 yr emphasized) is shown by the thick curve. The blue-shaded region indicates the two standard error uncertainty limits in the reconstruction (see Mann et al., 1998 for details). Additional data are available online at [ftp://ftp.ngdc.noaa.gov/paleo/paleocean/by\\_contributor/mann1998/mannnhem.dat](ftp://ftp.ngdc.noaa.gov/paleo/paleocean/by_contributor/mann1998/mannnhem.dat).

that the warmth of the 1990s (three years in particular: 1990, 1995, 1997) was unprecedented in at least the past 600 years, taking into account the self-consistently estimated uncertainties in the reconstruction back to A.D. 1400. Based on the most recent extensions of this reconstruction (Mann et al., 1999), it furthermore now appears that 1998 was likely to have been the warmest year of at least the past millennium. (Millennium reconstructions are available online: [http://www.ngdc.noaa.gov/paleo/ei/ei\\_millenm.html](http://www.ngdc.noaa.gov/paleo/ei/ei_millenm.html).)

The raw NH annual-mean series used for calibration (based on the full sampling available during the 1902–80 calibration period; see Figure 2) and verification (based on the sparser sampling available during the 1854–1901 verification interval; see also Figure 2) are also shown (Figure 7) along with the reconstructed NH series constructed from the corresponding spatial samplings (this is for the sake of comparison with the available instrumental record back in time; the NH series reconstruction discussed elsewhere is based on the full spatial sampling of

## NORTHERN HEMISPHERE ANNUAL MEAN TEMPERATURE

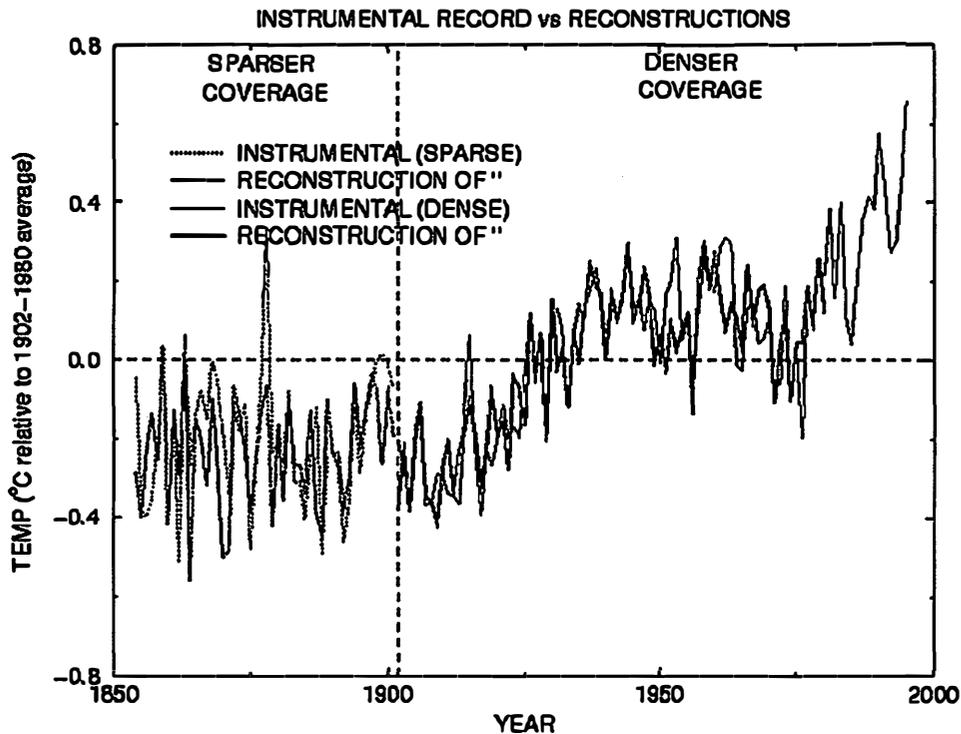


Figure 7. Reconstructed NH mean temperature series vs raw instrumental NH series from 1854 to 1980. For the purposes of a meaningful comparison, the NH spatial means have in this case been diagnosed in both the raw data and reconstructions from the sparse gridpoint coverage of the verification period from 1854 to 1901 ([ftp://ftp.ngdc.noaa.gov/paleo/paleocean/by\\_contributor/mann1998/nhem-sparse.dat](ftp://ftp.ngdc.noaa.gov/paleo/paleocean/by_contributor/mann1998/nhem-sparse.dat)), and the dense coverage of the calibration period from 1902 to 1980 ([ftp://ftp.ngdc.noaa.gov/paleo/paleocean/by\\_contributor/mann1998/nhem-dense.dat](ftp://ftp.ngdc.noaa.gov/paleo/paleocean/by_contributor/mann1998/nhem-dense.dat)).

the calibration period, which is implicit in the pattern reconstructions back in time). The good overall correspondence between the reconstructed NH series in both calibration and independent verification intervals visually confirms the quantitative indications of statistical skill discussed earlier.

We focus on the NH mean temperature series because it is the most reliable hemispheric estimate given the available spatial sampling in the surface temperature fields (Figure 2). Nonetheless, Southern Hemisphere (SH) and global (GLB) mean temperatures can be diagnosed from the appropriate areally weighted averages of the available spatial sampling in the pattern reconstructions. Taking into account the limitations in these latter estimates (the SH sampling is almost entirely

## HEMISPHERE vs GLOBAL TEMPERATURE TRENDS

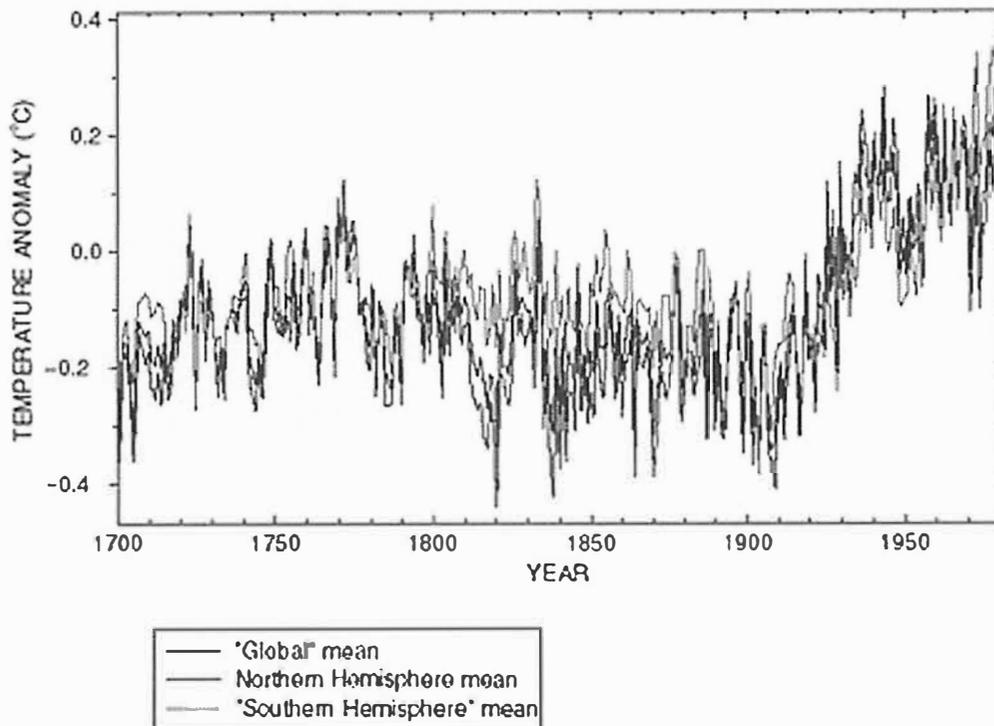


Figure 8. Comparison of reconstructed annual-mean temperature trends for Southern Hemisphere, Northern Hemisphere, and global mean, diagnosed from the available spatial sampling (Figure 1). Additional data are available online at [http://www.ngdc.noaa.gov/paleo/ei/ei\\_reconsa.html](http://www.ngdc.noaa.gov/paleo/ei/ei_reconsa.html).

tropical and subtropical, and the GLB estimate is necessarily dominated by the coverage in the Northern Hemisphere half of the domain), some interesting conclusions can be drawn. While the two hemispheres (NH and SH series) show similar temperature trends during the past few centuries (Figure 8), the coldness of the nineteenth century appears to be somewhat more pronounced for the Northern Hemisphere. The GLB series, dominated by the Northern Hemisphere half of the domain, shows similar character to the NH series. Only through assembling a greater distribution of both instrumental and proxy data in the Southern Hemisphere will it be possible to calculate truly meaningful estimates of Southern Hemisphere and global temperature variations during past centuries.

It is also instructive to examine the trends in different latitude bands. Overpeck et al. (Overpeck et al., 1997) suggested that post-1850 warming was more dramatic at high northern latitudes relative to lower latitudes due to larger positive feedbacks at high latitudes. The annual-mean temperature trends at high latitudes

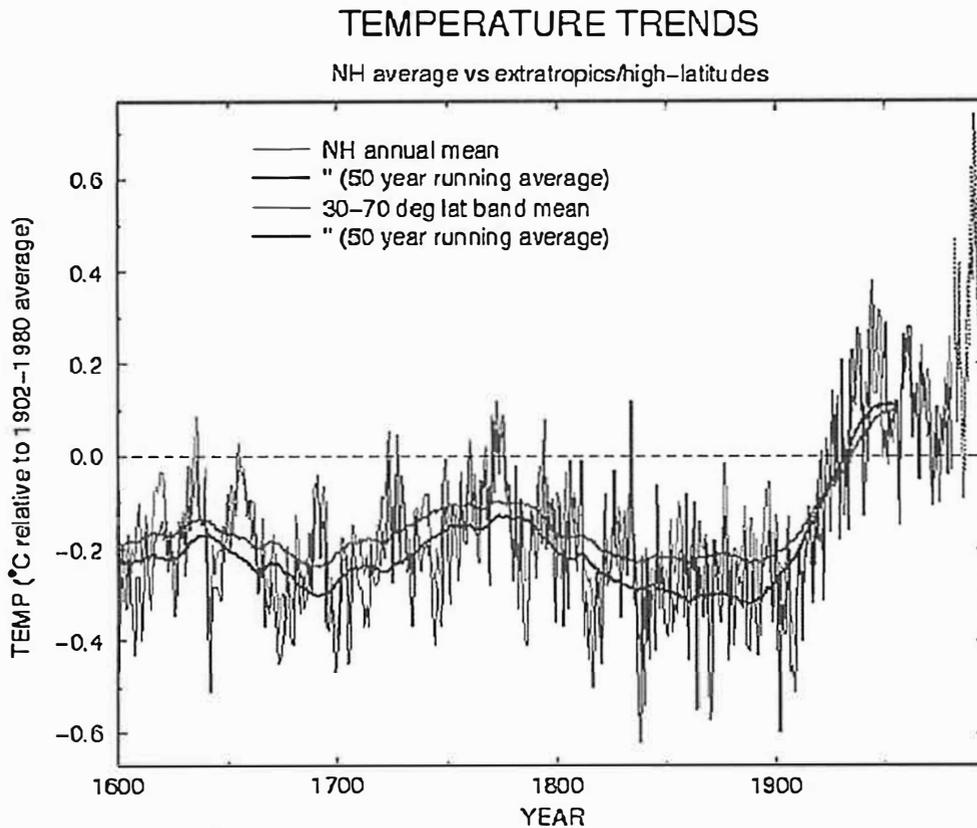


Figure 9. Reconstructed annual-mean NH mean temperature series based on full latitudinal coverage (red) vs the average reconstructed series for the extratropical latitude 30°–70°N band (blue). Additional data are available online: [http://www.ngdc.noaa.gov/paleo/ei/ei\\_reconsa.html](http://www.ngdc.noaa.gov/paleo/ei/ei_reconsa.html).

are seen (Figure 9) to be greater than the hemispheric trends themselves. In contrast, the tropical (30°S–30°N) band shows less change than the entire Northern Hemisphere series.

It is also instructive to compare hemispheric trends with other more regional temperature trends. In Figure 10, we show the reconstructed NH series along with an areal-mean reconstruction over the North American region, during the past few centuries. It is clear that the nineteenth century was especially cold in North America (approximately 0.6°C colder than the entire NH mean), and the subsequent warming trend of the twentieth century accordingly more dramatic (i.e., approximate 1.2° vs 0.6°C). The fluctuations are significantly greater on almost all timescales for the North American series, which is simply a consequence of the spatial sampling statistics of a smaller region. It is thus clear that one would be remiss in drawing conclusions regarding hemispheric-scale temperature changes from such highly variable regional temperature estimates, underscoring the

## LONG-TERM TEMPERATURE TRENDS

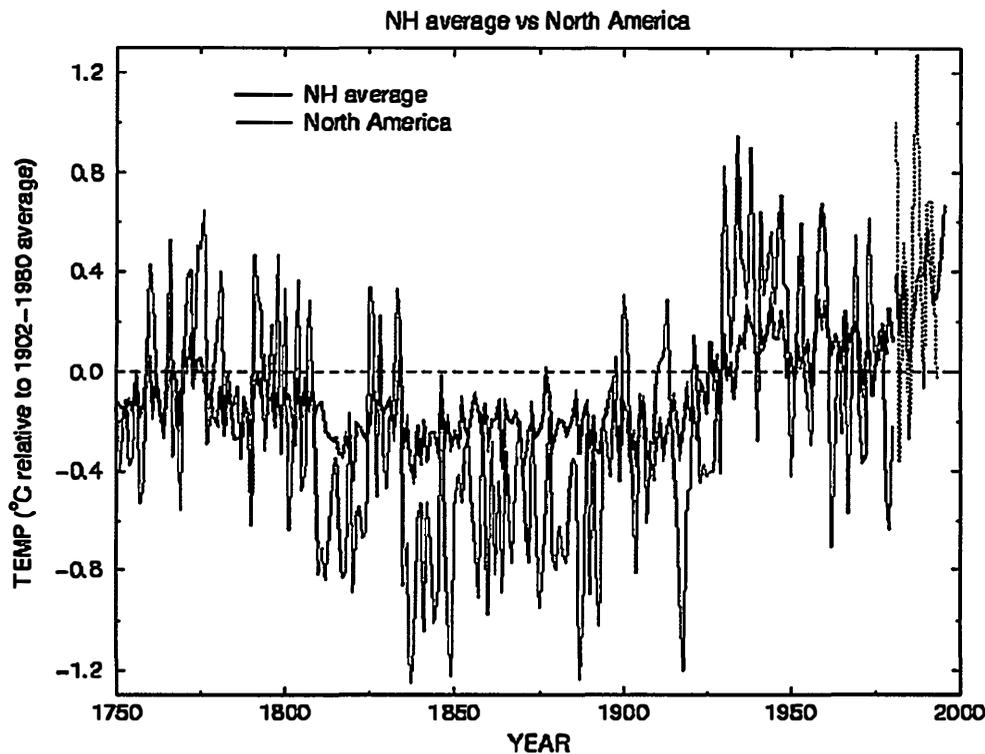


Figure 10. Comparison of reconstructed NH (red) and North American (blue) regional temperature variations during past centuries.

importance of drawing inferences from the largest-scale mean trends in which regional “noise” is dampened and certain types of signals (e.g., the influence of climate forcings, discussed later) are more clearly detected. Seasonal distinctions are also clearly important. For example, it is clear that interannual fluctuations in European cold-season temperatures are considerably greater than those during the warm season (Figure 11). This observation is consistent with the impact of the large year-to-year variability in the predominantly cold-season NAO phenomenon (see, e.g., Luterbacher et al., 1999; Mann, 2000; Cullen et al., 2000). The impact of the NAO and detailed regional inferences are discussed in detail in the subsequent section.

We also provide the time histories of the first five RPC series (along with their raw counterparts from 1902 to 1993; see Figure 12). Note that the RPCs are available for different lengths back in time owing to the decreasing spatial degrees of freedom resolved by the multiproxy network back in time (see Mann et al., 1998 for a discussion).

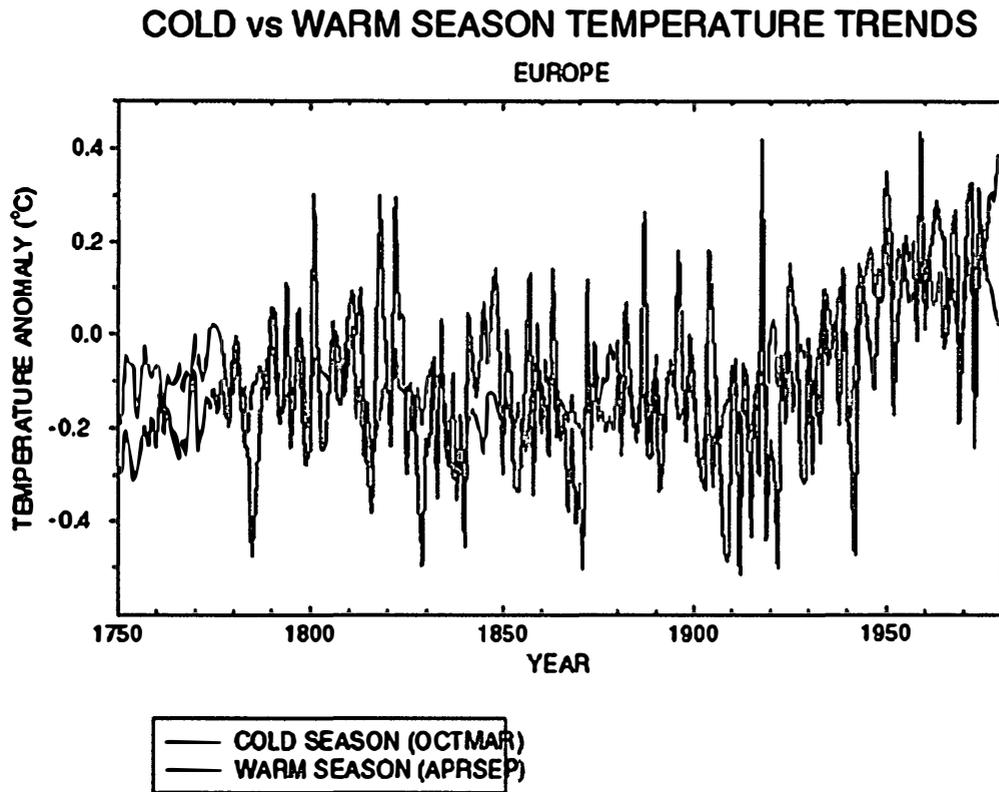


Figure 11. Comparison of European temperature trends back to 1750 for cold and warm half-year seasonal windows.

### 3.2. Spatial patterns

Yearly global temperature maps for annual mean, boreal cold season, and warm season are available below for the reconstructed temperature fields (1730–1980), the raw temperature data (1902–93) used for calibration, and the sparse raw “verification” temperature data (1854–1901) used for cross-validation. Also available are the “EOF filtered” instrumental data from 1902 to 1993. In the latter case, only that data variance during the calibration period described by the actual eigenvectors used to calibrate the multiproxy network (see section 2) is retained. These filtered versions of the raw data are thus in some sense a more appropriate standard for comparison to the multiproxy-reconstructed patterns than the raw data themselves.

Raw data and reconstructed patterns can be compared side by side where available. These maps are “clickable” so that time series for particular regions (with uncertainties, in the case of reconstructions) can be obtained. Movie 1 shows the temperature fields.

To investigate the spatial patterns and time histories of the global temperature

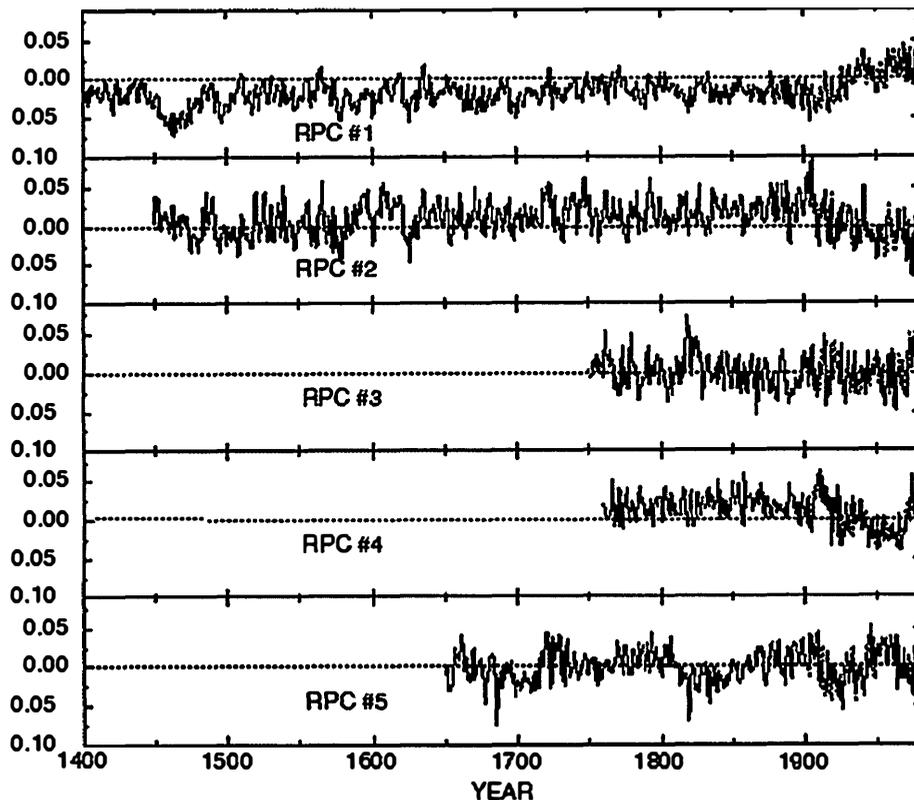
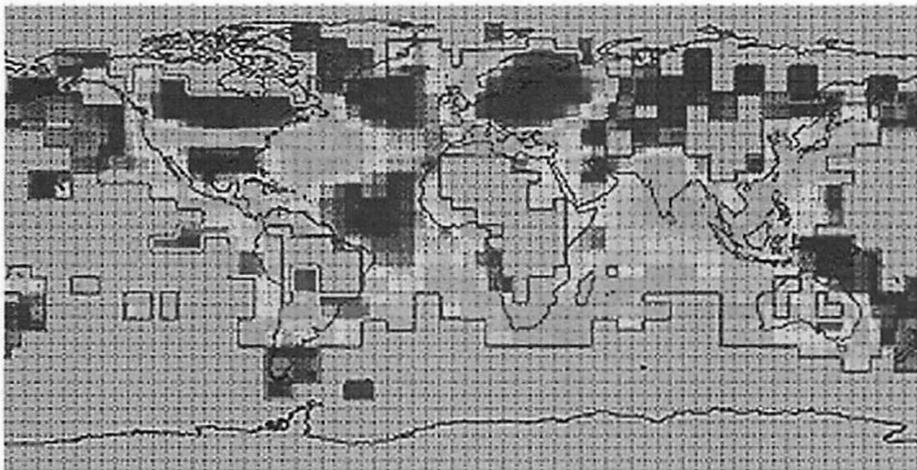


Figure 12. RPC series for the first five eigenvectors (see Figure 3) back in time, along with their twentieth century instrumental counterparts. Annual-mean and seasonal RPC data can be found online at the bottom of the following Web page: <http://www.ngdc.noaa.gov/paleo/ei/eIreconsa.html>.

reconstructions, readers can begin by visiting the following site online: <http://www.ngdc.noaa.gov/cgi-bin/paleo/mannplot2.pl>, where maps such as the one for 1730 shown below can be viewed.

In part due to the especially strong El Niño of 1997–98, there has been renewed interest in past variations in the El Niño phenomenon, and the context in which they place prominent recent (1997–98 and 1982–83) events. Two excellent examples of past very strong El Niños in the reconstructions are those evident in the temperature patterns for 1791 and 1878 (Figure 13). Independent corroboration of these events is provided by the historical chronology of Quinn and Neal (Quinn and Neal, 1992; see also Mann et al., 1998). The reader may note that an improvement upon this historical El Niño chronology has recently

**1791**



**1878**

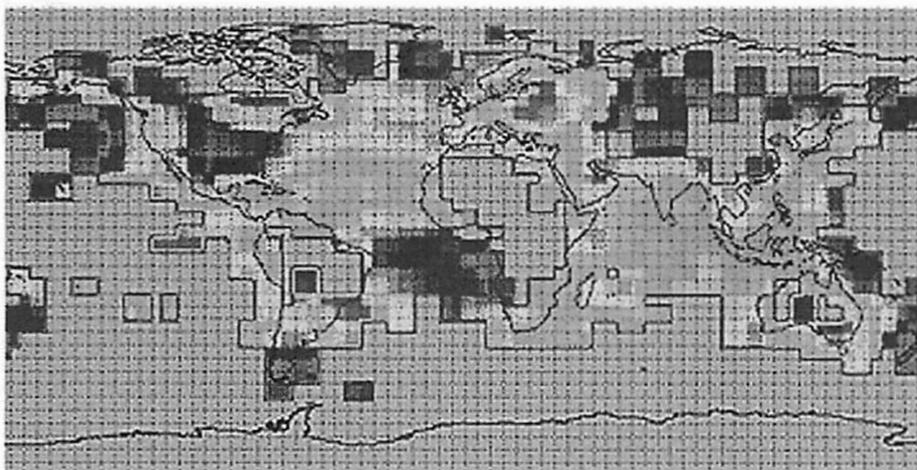


Figure 13. Global temperature pattern reconstructions for two historically documented very strong El Niño events during (top) 1791 and (bottom) 1878.

been provided by Ortlieb (Ortlieb, 2000), with conclusions that sometimes differ from those of Quinn and Neal (Quinn and Neal, 1992). We note, however, that, to the extent that the Quinn and Neal chronology used here is imperfect, it will provide a very conservative corroboration of our own chronology, as mismatch may be due to uncertainties in the chronology as well as in our reconstruction. Both events shown exhibit the classic eastern tropical Pacific warming and horseshoe pattern of warming and cooling in the North Pacific. The details of ENSO-

related patterns of variation in the annual-mean temperature reconstructions are discussed by Mann et al. (Mann et al., 2000).

The reconstructed annual-mean Niño-3 index provides an estimate of El Niño-related temperature variability in our reconstructions. Based on this index, the 1997–98 and 1982–83 events appeared (see the discussion in Mann et al., 2000) to be among the strongest events back to at least A.D. 1650. However, it could not be concluded with much certainty at that time that they are stronger than any other events during that period, owing to the appreciable uncertainties in the reconstructions for the tropical Pacific region and the suboptimal calendar-mean basis for that reconstruction.

However, as is evident in the statistics, the cold-season Niño-3 index calibrates/cross-validates a considerably larger share of the instrumental data variance than the annual-mean series (about 50% in calibration and verification back to 1780, and about 40% back to 1650). This is not surprising because a boreal cold-season window is a more appropriate basis for defining the ENSO phenomenon than a calendar mean. Our winter Niño-3 reconstruction exhibits a highly significant correlation with largely independent reconstruction of the winter (Dec–Jan–Feb) SOI of Stahle et al. (Stahle et al., 1998). The two reconstructions are correlated at  $r = 0.63$  over the full period of overlap (1705–1976) and  $r = 0.60$  during the precalibration interval (1705–1901). This is nearly as high as the observed correlation ( $r = 0.7$ ) between the instrumental SOI and Niño-3 series during the twentieth century. The similarity of these two reconstructions, as well as the significant correspondence with the historically based El Niño chronology of Quinn and Neal (Quinn and Neal, 1992) discussed earlier (see cold-season calibration/verification statistics available online: [http://www.ngdc.noaa.gov/paleo/ei/ei\\_calverif.html](http://www.ngdc.noaa.gov/paleo/ei/ei_calverif.html)), suggests considerable reliability in the ENSO-related features of our surface temperature reconstructions. Using this improved, seasonal reconstruction of Niño-3 (Figure 14) we find added evidence that the two recent events, 1982–83 and 1997–98, stand out as somewhat anomalous in the long-term record. There is evidence that certain events (such as the 1877–78 El Niño) may be more underestimated in their amplitude in our reconstruction than would be expected from random calibration uncertainties. This is difficult to determine, as the instrumental surface temperature record is quite sparse during that period of time. Moreover (see Mann et al., 2000), the winter SOI, used as a substitute for the Niño-3 index, shows quite similar behavior to our reconstruction at that time. Only further work with both the instrumental record and proxy climate records in ENSO-sensitive regions will further elucidate this issue. (Annual-mean Niño-3 indices are available online at [http://www.ngdc.noaa.gov/paleo/ei/ei\\_Niño-3ann.html](http://www.ngdc.noaa.gov/paleo/ei/ei_Niño-3ann.html) and Niño-3 cold-season data are available at [http://www.ngdc.noaa.gov/paleo/ei/ei\\_data/Niñocold-recon.dat](http://www.ngdc.noaa.gov/paleo/ei/ei_data/Niñocold-recon.dat).)

As commented upon earlier, there are important distinctions between regional and hemispheric trends, with regional trends exhibiting considerably greater variability and heterogeneity. Cold and warm periods in different parts of the globe, for example, are not in general synchronous. Even during the “Little Ice Age” (Bradley and Jones, 1993) not all areas were uniformly cold; geographical and temporal variations were apparent, as highlighted by an examination of the re-

## ENSO RECONSTRUCTIONS

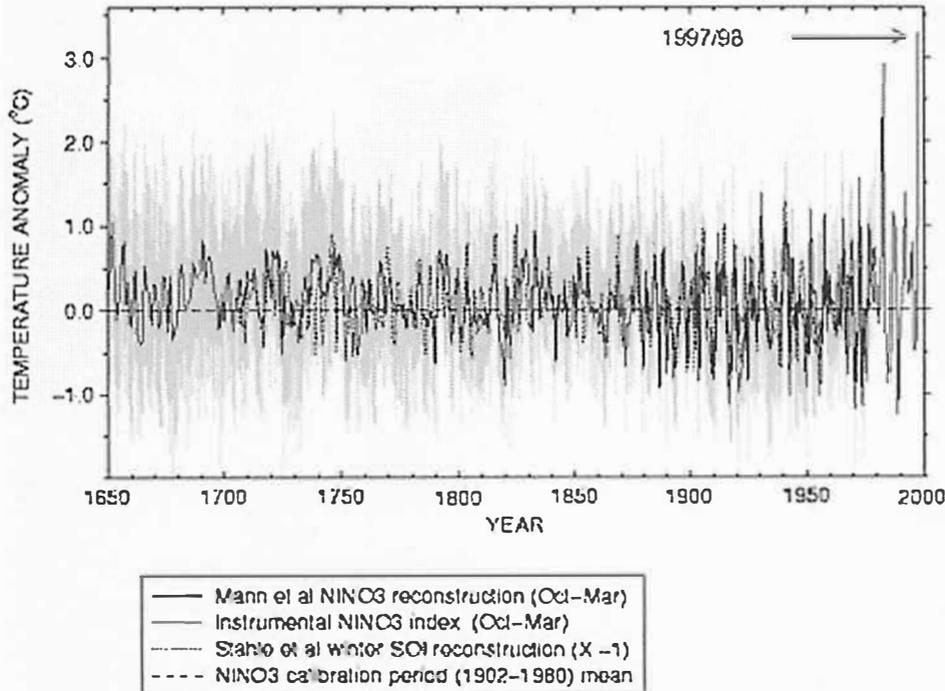


Figure 14. Reconstructed boreal cold-season Niño-3 index back to 1650. Shown for comparison is a partially independent (dendroclimatic rather than multiproxy) winter (DJF) reconstruction of the SOI (Stahle et al., 1998). Yellow-shaded region indicates the 95% confidence bounds for the Niño-3 reconstruction.

constructions presented here. The “Medieval Warm Period” or “Medieval Optimum” (Hughes and Diaz, 1994) is even more enigmatic.

It is sometimes erroneously argued that the globe was as warm or even warmer than present during the early part of the millennium (e.g., A.D. 1000–1200) based on historical or anecdotal considerations (e.g., the early colonization of Greenland, unusually bountiful agricultural yields and wine harvests in Europe early in the millennium, etc.). Mann et al. (Mann et al., 2000) use a careful statistical analysis to show that the sparse regional information available earlier than A.D. 1400, while allowing for verifiable hemispheric temperature reconstructions back to about A.D. 1000, is associated with self-consistent estimates of uncertainties that are greatly expanded beyond those during more recent centuries.

These limitations notwithstanding, the best evidence, based on the extension of hemispheric climate reconstructions back a full millennium, is that late twen-

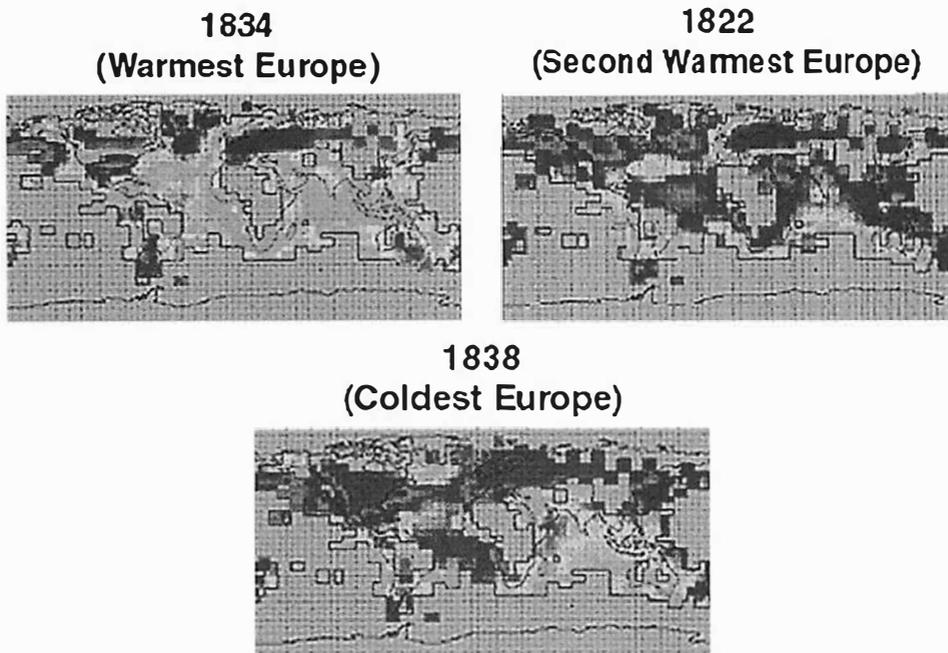


Figure 15. Global annual-mean temperature pattern reconstructions for three years associated with unusually warm or cold anomalies in the European sector during (top, left) 1834, (top, right) 1822, and (left) 1838.

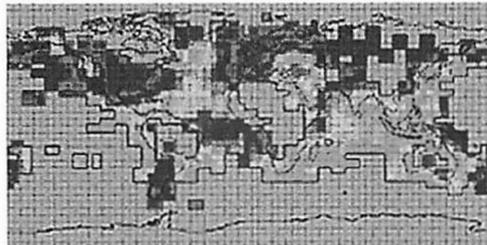
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tieth century conditions are probably warmer than those that prevailed at any time this millennium, though conditions during the eleventh through fourteenth centuries appear warmer than those that prevailed during the fifteenth through nineteenth centuries in general. This conclusion is supported by independent estimates based on composites of modest numbers of Northern Hemisphere proxy records (Jones et al., 1998; Crowley and Lowery, 2000). The nineteenth century was particularly cold for *both* Europe and North America (the reader is referred to the regionally averaged temperature series for North America and Europe here). This period comes closest to being a truly “global” cold period (see Mann et al., 1999) although, as noted earlier, even in this case the cooling is not nearly as evident in the Southern Hemisphere.

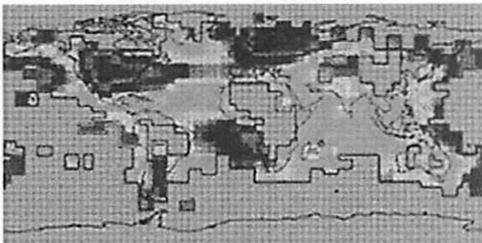
To illustrate some of the problems inherent in estimating hemispheric mean temperature from limited regional information, consider (Figure 15) the warmest (1834), second warmest (1822), and coldest (1838) years in Europe prior to the twentieth century, based on the Mann et al. (Mann et al., 1998) temperature pattern reconstructions.

While 1834 was the warmest year in Europe, it was colder than typical conditions (by twentieth century standards) over large parts of the Northern Hemisphere. This is especially true for 1822, the second warmest year in Europe, but

**1816**  
**("A Year Without A Summer")**



**1816 - Cold Season**



**1816 - Warm Season**

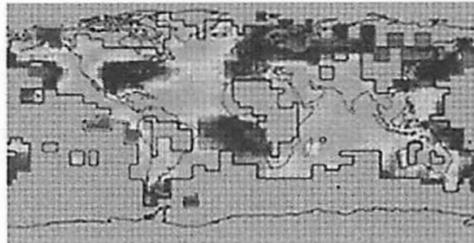


Figure 16. Annual-mean global temperature pattern reconstructions for the so-called year without a summer—1816.

a cold year over most of the Northern Hemisphere. In contrast, the coldest year in Europe (1838) was indeed one of the coldest over much of the Northern Hemisphere (see discussion below), but in fact, temperatures were nonetheless warm, relative to typical twentieth century conditions, over significant portions of Greenland and Alaska. The coldest years in Europe might, by analogy with this example, have been quite unusually mild in Greenland, and a favorable opportunity for its colonization. It becomes readily evident from such examples (let alone, more careful statistical diagnostics) that inferences into hemispheric or global-scale temperature variations based on limited regional (e.g., European) information are perilous. In fact, the considerable low-frequency “noise” in the Atlantic and neighboring regions, due in large part to modes of ocean circulation variability (see, e.g., Delworth and Mann, 2000), and the substantial overprint of the North Atlantic oscillation on climate variations in this region during past centuries (see, e.g., Cullen et al., 2000; Mann, 2000) particularly obscures hemispheric trends in this region. There is modeling evidence, in fact, that suggests that medieval warmth was restricted to regions influenced by the North Atlantic (Overpeck, 1998). Statistically speaking, estimates of European temperature variability provide a very poor indication of large-scale temperature trends in past centuries, and should be strictly avoided for hemispheric, let alone global scale, climate inferences.

Note that 1816 (the so-called year without a summer; Figure 16), in addition to appearing to have indeed been an especially cold summer (see Briffa et al.,

1998) and a cold year for the NH temperature as a whole (though not anomalous relative to other years during that very cold decade), was an anomalously cold year only in Europe and parts of North America. In fact, conditions in the Middle and Near East were warmer than normal by twentieth century standards.

A number of other years (1870, 1864, 1838, 1820, 1700, 1642, and many years during the 1450s and 1460s) appear to have been *substantially* colder than 1816 for the hemisphere as a whole in the temperature reconstructions presented here. Our notions of this year as a particularly cold one may thus arise in large part from the fact that the coldness was most pronounced in those regions—Europe and North America—that figure most prominently in the western anecdotal and historical framework. The regional overprints of warming (e.g., in the Middle East) and extreme cold (e.g., Europe) that are superimposed on generally cold hemispheric conditions, in regions neighboring the North Atlantic, may be attributed to the NAO [see Luterbacher et al. (Luterbacher et al., 1999), Cullen et al. (Cullen et al., 2000), and Mann (Mann, 2000) for a discussion of inferences into past NAO-related climate variability]. We believe that both the cold hemispheric conditions, and a strong NAO-like atmospheric circulation anomaly, were due to the explosive Tambora eruption in Indonesia during spring of 1815 (see Mann et al., 1998). Seasonally specific reconstructions of 1816 for the cold (Oct–Mar) and warm (Apr–Sep) half-years (see Figure 16) indicate that this pattern is clearer and more dominant during the cold season, wherein the quadrupole pattern of warm and cold anomalies in continental regions bordering the North Atlantic is quite distinct. This is as expected, since the NAO is primarily, though not exclusively, a cold-season mode of atmospheric circulation variability. There is some evidence of the persistence of this pattern, albeit more weakly, into the warm season. In particular, distinct cooling in the eastern United States and over much of Europe is clearly expressed during the warm season, consistent with the notion of 1816 having been a year without a summer in those regions. Some of the coldness of the early nineteenth century might also be due to weakened solar irradiance forcing at that time. The possible influences of external climate forcings on hemispheric temperatures are discussed below.

### **3.3. Influence of climate forcings**

The statistical relationship between variations in NH mean temperature and estimates of the histories (see Mann et al., 1998) of solar, greenhouse gas, and volcanic forcings is shown in Figure 17. [For a note about the difference between the plot shown herein and that shown in Mann et al. (Mann et al., 1998), see [http://www.ngdc.noaa.gov/paleo/ei/ei\\_attriold.html](http://www.ngdc.noaa.gov/paleo/ei/ei_attriold.html).]

While the natural (solar and volcanic) forcings appear to be important factors governing the natural variations of temperatures in past centuries, only human greenhouse gas forcing alone, as noted by Mann et al. (Mann et al., 1998), can statistically explain the unusual warmth of the past few decades. The possible influences of regional industrial aerosol cooling during the latter part of the twentieth century (see Houghton et al., 1995) were not included in our attribution analysis, and this cooling may in fact mask an even stronger greenhouse gas signal during the past few decades.

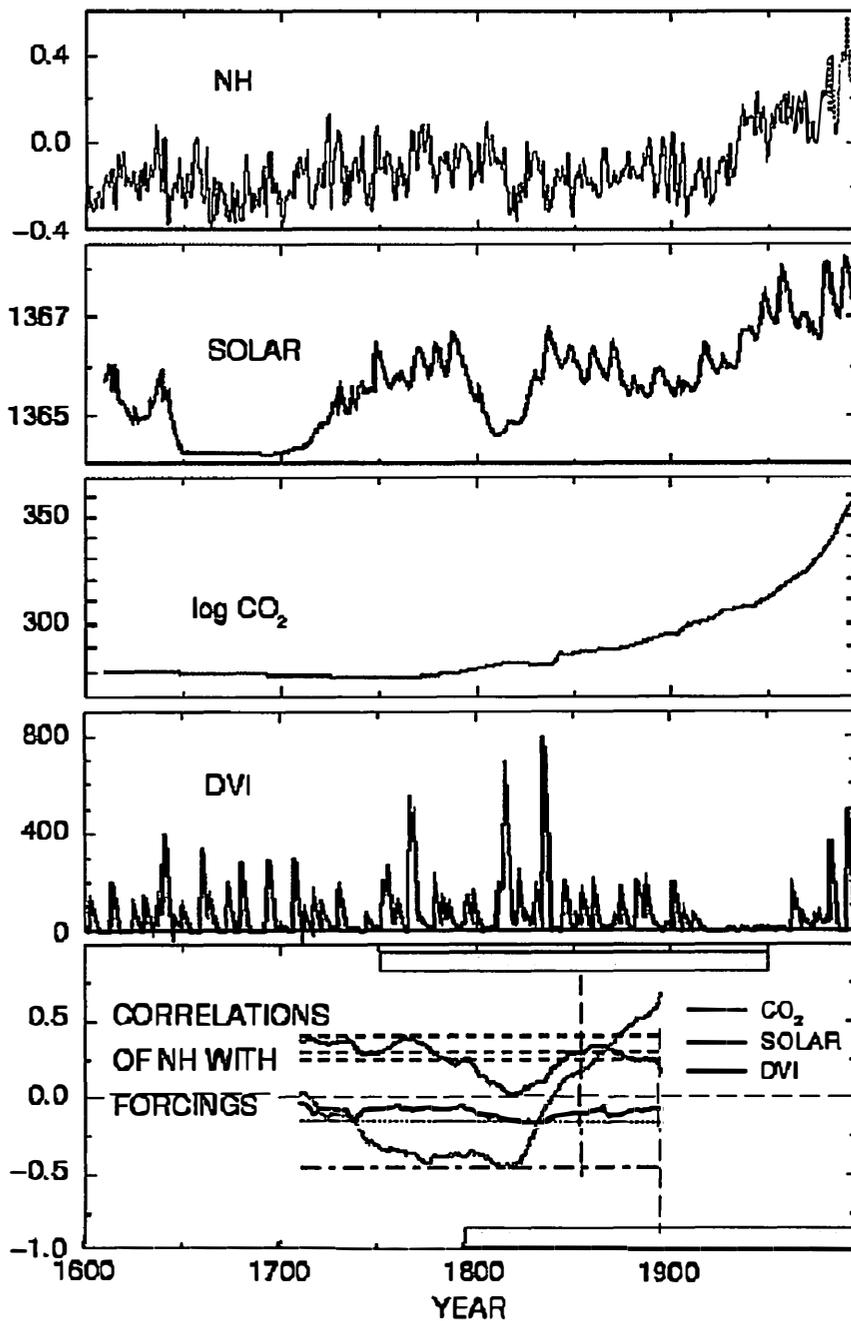


Figure 17. Relationship of annual-mean NH mean temperature reconstruction to estimates of three candidate forcings (see Mann et al., 1998) between 1610 and 1995.

Mann et al. (Mann et al., 1998) noted that the contemporaneous (i.e., zero delay) response to forcings implicit in their statistical attribution analysis may underestimate the true, lagged responses to forcing. Volcanic responses appear to be slightly greater and more consistently significant about 1 yr following the eruption (see Briffa et al., 1998), while the response of the climate to global radiative forcings should be significantly delayed [e.g., 10–20 yr based on most sensitivity estimates; see Houghton et al. (Houghton et al., 1995)] by the thermal inertia of the oceans. In Figure 18 we investigate possible such lagged relationships to forcing. We also examine the sensitivity of the time-dependent attribution approach discussed above to employing a shorter (100 yr) window. A complementary approach to the attribution of forcings involves the use of a climate model forced with estimated histories of greenhouse, volcanic, and solar radiative forcings to estimate the expected large-scale temperature trends in past centuries. Preliminary results of such an experiment (Robertson et al., 1998) show a favorable comparison with our hemispheric temperature reconstructions.

From the above analysis it is clear that when physically reasonable lags are incorporated into the attribution analysis, there is evidence of even greater statis-

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Figure 17. (continued) (a) Reconstructed NH temperature series from 1610 to 1980, updated with raw data from 1981 to 1995. (b) GHGs represented by atmospheric CO<sub>2</sub> measurements. (c) Reconstructed solar irradiance (see Lean et al., 1995). (d) Weighted volcanic dust veil index (DVI). (e) Evolving multivariate correlation of NH series with the three forcings (a, b, and c).

The time axis denotes the center of a 200-yr moving correlation window. Significance levels are based on the null hypothesis that the surface temperature series is a realization of natural variability represented as represented by a red noise process with the persistence structure of the observed NH series (see Mann et al., 1998 for details). One-sided significance levels for correlations with the different forcing agents are shown, under the assumption that only positive relationships with GHG and CO<sub>2</sub>, and negative relationships with DVI, are physically meaningful. These confidence levels are approximately constant over time and are thus represented by their average values over time for simplicity (although the number of degrees of freedom in the CO<sub>2</sub> series is somewhat decreased prior to 1800 when the series is essentially flat, so that the confidence intervals are slightly too liberal in this case). Significance levels for correlations of temperature with CO<sub>2</sub> and solar irradiance are nearly identical, and the 90%, 95%, and 99% (positive) significance levels are shown by the horizontal dashed lines. The 95% (negative) significance level for DVI is shown by a horizontal dotted line. The lower dotted line indicates the 99% significance level for correlation with GHG if a *two-sided* hypothesis test is invoked (this is only added to emphasize that the seemingly spurious negative correlation of NH with GHG apparent during the late eighteenth–early nineteenth century is in fact not statistically significant if the a priori physical requirement of a positive relationship between CO<sub>2</sub> and temperature is not taken into account in hypothesis testing). The gray bars indicate two different 200-yr windows of data in the moving correlation, with the long-dashed vertical lines indicating the center of the corresponding windows.

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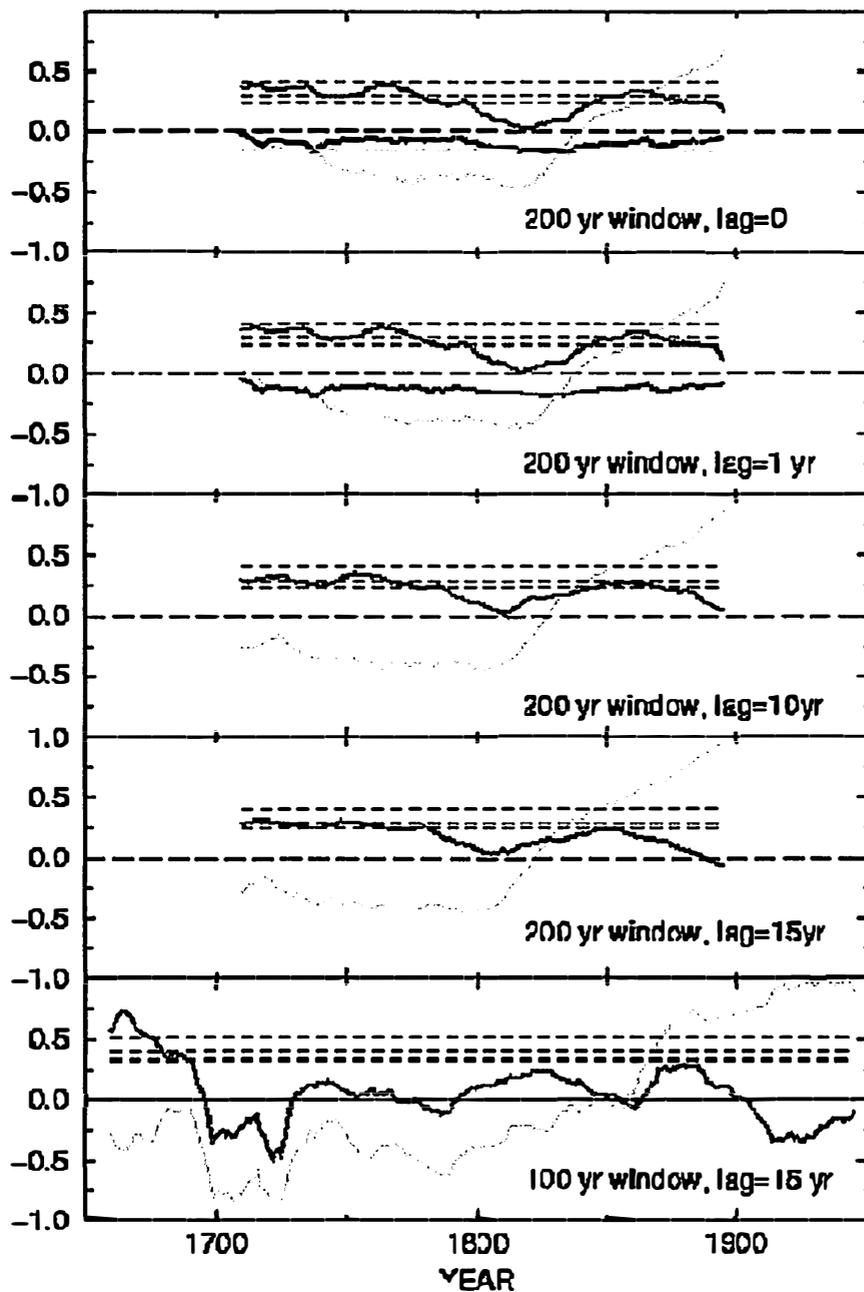


Figure 18. Relationship between NH series and forcings as above, but employing varying values of lag of temperatures relative to forcing. Symbols are same as above. The first five panels make use of the 200-yr window used

tical relationships with particular forcings. At the physically expected lag of 1 yr, the relationship between temperature variations and volcanic forcing is *slightly* more consistent and significant (at or near 95% significant for much of the interval examined, in contrast with the zero-lag case). For lags of 10–15 yr the relationship between greenhouse gas (GHG) increases in recent decades and increasing temperatures is considerably more significant, while the relationship with solar irradiance is considerably less significant. For the shorter (100 yr) window there are few enough degrees of freedom in the temperature and forcing series that the statistics are not as stable (i.e., the results are much “noisier”). In particular, larger negative correlations with GHGs are achieved prior to 1800 in this case, although these are not significant taking into account the decreased degrees of freedom in the series. Nonetheless, even with the large sampling variations that arise in the 100-yr window case, the relationship between recent warming and increasing greenhouse gas concentrations is the dominant statistical feature. It is evident that the inclusion of a representation of the lagged response of temperatures to forcing heightens the evidence for a recent anthropogenic impact on twentieth century climate beyond that presented in Mann et al. (Mann et al., 1998).

#### 4. Summary

A number of important conclusions are evident from the global-scale temperature reconstructions presented here. The sequences of annual and seasonal spatial temperature patterns presented in this study provide considerably more insight into the large-scale trends discussed in earlier work. The combination of multiple factors including El Niño/La Niña influences; interannual, decadal, and multidecadal patterns of extratropical variability; and putative responses to external forcings (such as volcanic aerosol loading of the upper atmosphere) leads to rich year-to-year spatial and temporal behavior that is readily documented in the annual temperature patterns. Considerable physical and dynamical insight into empirical climate variability over several centuries is thus obtained from the details of the patterns of annual and seasonal surface temperature variation. Some important new insights into the largest-scale climate trends are also available. As documented previously, not only is the global-scale warmth of the most recent decade observed to be quite unusual in the context of at least the past six centuries

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Figure 18. (continued) above. In the first panel, we repeat the zero-lag case shown above for comparison, while the second panel shows the results for 1-yr lag, the third panel the 10-yr lag, and the fourth panel the 15-yr lag. The fifth panel shows the results based on employing a 100-yr moving window in the time-dependent attribution analysis, and with a 15-yr lag in the relationship of temperature to forcings. For lags much larger than 1 yr, the relationship of temperatures to volcanic forcing is not physically meaningful and is quite small. Thus, the relationship to volcanic forcing is not shown in the third, fourth, and fifth panels.

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(and evidently, at least the past millennium), but 1998—the warmest year in the instrumental record—is seen to be truly exceptional in a long-term context. There is, however, a distinct latitudinal, seasonal, and spatial dependence evident in surface temperature trends during the past few centuries. Certain recent El Niño events (i.e., 1997–98 and 1982–83) also appear to be somewhat anomalous in the context of the past few centuries, though the recent trends in ENSO indices are not nearly as dramatic as those in the recent hemispheric warmth. Indeed, revised statistical attribution analyses comparing the hemispheric temperature series to candidate external forcings show greater evidence for a likely anthropogenic influence than that presented previously, when the potential for a lagged response of the climate system to radiative forcing (owing to oceanic thermal inertia) is taken into account.

It is clear that the primary limitations of large-scale proxy-based reconstruction in past centuries, both temporally and spatially, reside in the increasingly sparse nature of available proxy networks available to provide reliable climate information back in time. Only through the arduous efforts of large numbers of paleoclimate researchers can such networks be extended in space and time to the point where significant improvements will be possible in proxy-based reconstruction of the global climate. Such improvements will lead to further advances in our empirical understanding of climate variations during the past millennium and will allow for more meaningful comparisons with the results obtained from model simulations of past climate variation and empirical climate variability.

**Acknowledgments.** We thank Robin Webb and the NOAA Paleoclimatology Program for helping motivate this interactive project. We are also grateful to Martin Munro, Richard Holmes, and Caspar Ammann for their technical assistance. This work was supported by the National Science Foundation and NOAA-supported Earth Systems History Program, and the U.S. Department of Energy.

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Subject: Amsterdam Congress ENSO session  
From: Keith Alverson <keith.alverson@pages.unibe.ch>  
Date: 4/19/01 5:50 AM  
To: Mike Mann <mann@virginia.edu>, Julie Cole <jcole@geo.arizona.edu>, Gerrit Burgers  
<Gerrit.Burgers@knmi.nl>, "Malcolm K. Hughes" <mhughes@lrr.arizona.edu>, Bette Otto-Bliesner  
<ottobli@ucar.edu>, utsets@yahoo.com, utset@isch.edu.cu

Dear ENSO session speakers,

This is a reminder that you must all register for the GCOSM meeting before April 30 (invited speakers are not exempt from this requirement!). To register please go to the website <http://www.sciconf.igbp.kva.se> and follow the instructions.

The tentative session timetable is attached. Should you have further questions let me know. Gerrit and I are looking forward to seeing you all in Amsterdam, and to a productive session.

Keith

-- Keith Alverson Executive Director PAGES International Project Office Bärenplatz 2, 3011 Bern Switzerland  
<http://www.pages-igbp.org> Tel: +41 31 312 31 33 Fax: +41 31 312 31 68

Attachments:

sessionA3 26.5 KB

Subject: land surface

From: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>

Date: 4/24/01 9:08 AM

To: tom crowley <tom@ocean.tamu.edu>, Ray Bradley <rbradley@geo.umass.edu>, mhughes@ltrr.arizona.edu, Jonathan Overpeck <jto@u.arizona.edu>, mann@virginia.edu

Dear All,

Thought you'd be interested in the latest coming out of the LLNL group, apropos to the discussions we had in Charlottesville...

mike

---

Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

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e-mail: mann@virginia.edu Phone: (804) 924-7770 FAX: (804) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

llnl-rpp042301.txt

FOR IMMEDIATE RELEASE: 23 APRIL 2001

Contact: Anne Stark  
stark8@llnl.gov  
925-422-9799  
Lawrence Livermore National Laboratory

Researchers prove past cooling trend caused by move from forests to agriculture

Livermore, Calif.â€”Researchers in Lawrence Livermore National Laboratoryâ€™s Atmospheric Science Division have demonstrated a cooling of up to 2-degree Fahrenheit over land between 1000 and 1900 AD as a result of changes from natural vegetation, such as forests, to agriculture.

Through climate model simulations, the LLNL research team made up of Bala Govindasamy, Ken Caldeira and Philip Duffy, determined that a previously recognized cooling trend up to the last century could, in part, be attributed to the land-use change.

Previous studies had attributed cooling to natural climate variations. The Livermore research, however, suggests that much of this cooling could have been the result of human activity.

Forests tend to look dark from the sky, but agricultural lands, with their amber waves of grain, tend to look much lighter. Dark colors tend to absorb sunlight, and light colors tend to reflect sunlight back out to space. Changing from forests to crops

results in more sunlight reflected back to space. This reflection of solar energy to space tends to cool the Earth, especially in regions such as the eastern and mid-western United States, where huge tracts of land have been converted to crops. In the 20th century, some of this cropland has been reverting back to forest, especially in the eastern United States.

Greenhouse gas emissions in the 20th century likely overcame any cooling trends that took place up to that time. Growing more trees has been suggested as a way to soak up carbon dioxide, a greenhouse gas, from the atmosphere. However, earlier studies demonstrate that growing dark forests could actually heat the earth's surface more because dark colors tend to absorb more sunlight, despite the uptake of carbon dioxide.

"The Earth land surface has cooled by about 0.41 K (= by about 3/4 of a degree Fahrenheit) due to the replacement of dark forests by lighter farms growing wheat, corn, etc.," said Caldeira, a climate model researcher who also is co-director for the Department of Energy's Center for Research on ocean carbon sequestration. "This is an example of inadvertent geoengineering -- we changed the reflectivity of the Earth and have probably caused a global cooling in the past. This is now probably being overwhelmed by our greenhouse gas emissions."

The research, published in the Geophysical Research Letters, also shows a slight increase in the annual means of global and Northern Hemisphere sea ice volumes in association with the cooling. The simulated annual average cooling due to land-use change during this period is almost a half a degree Fahrenheit globally, 0.66 °F for the Northern Hemisphere and .74 °F over land.

In the simulations, land use data for 1000 AD uses potential natural vegetation, made up mainly of forests, while data for the 1900 AD period uses standard current vegetation data, which is a mix of forest and croplands, taken from the Community Climate Model developed at the National Center for Atmospheric Research. The greenhouse gas levels in both simulations are in concentrations taken at pre-industrial levels.

"The estimated temperature change in the continental United States as a result of change from forests to agriculture is up to a 2-degree Fahrenheit cooling," Caldeira said. "So, when we talk about global warming, we can no longer take for granted that this global warming is starting from some natural climate state, undisturbed by human activities."

###

Founded in 1952, Lawrence Livermore National Laboratory is a national nuclear security laboratory, with a mission to ensure national security and apply science and technology to the important issues of our time. The National Nuclear Security

Subject: Fwd: Re: reprint request  
From: "Michael E. Mann" <mann@virginia.edu>  
Date: 6/3/01 7:49 AM  
To: rbradley@geo.umass.edu, Scott Rutherford <rutherfo@deschutes.gso.uri.edu>, mhughes@ltrr.arizona.edu

> From: majorowi@freenet.edmonton.ab.ca  
> Date: Sat, 2 Jun 2001 17:22:12 -0600 (MDT)  
> To: "Michael E. Mann" <mann@virginia.edu>  
> Subject: Re: reprint request  
>  
> hi Michael:  
> enclosed is a reprint of cr paper attched as a .PDF file.  
> at this point i still have not received hard copy reprints.  
> let me know if this is satisfactory.

> best regards  
> Jacek

>  
> Dr. J.A. Majorowicz  
> Northern Geothermal  
> 105 Carlson Close  
> Edmonton Alberta  
> T6R 2J8 Canada  
> PH (780) 438-9385  
> FAX (780) 438 9419

> Website:  
> <http://www.freenet.edmonton.ab.ca/~majorowi/>

> On Sat, 2 Jun 2001, Michael E. Mann wrote:

>> Dear Dr. Majorowicz,

>> I'd appreciate a reprint of your recent paper "Reconstruction of the  
>> Surface Warming History..." that appeared in the journal "Climate  
>> Research", when available.

>> Thanks very much in advance,

>> Best regards,

>> mike mann

---

>> Professor Michael E. Mann  
>> Department of Environmental Sciences, Clark Hall  
>> University of Virginia  
>> Charlottesville, VA 22903

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>> e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (804) 924-7770 FAX: (804) 982-2137  
>> <http://www.evsc.virginia.edu/faculty/people/mann.shtml>

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Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

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e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (804) 924-7770 FAX: (804) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

**Attachments:**

CR2001.PDF 503 KB

Subject: Re: Asheville workshop(s)  
From: Malcolm Hughes <mhughes@ltrr.arizona.edu>  
Date: 1/4/02 12:48 PM  
To: "Michael E. Mann" <mann@virginia.edu>  
CC: hfd@cdc.noaa.gov, rbradley@geo.umass.edu, mhughes@ltrr.arizona.edu, Connie.Woodhouse@noaa.gov, mann@virginia.edu, srutherford@virginia.edu, Cary Mock <MockCJ@gwm.sc.edu>

I'm involved in a PIs meeting for the IAI project headed up by Brian Luckman either on the weekend of 4/19-22 or 4/26-29. I'm teaching summer session May 13-31, Cheers, Malcolm

Subject: Re: Letters

From: Malcolm Hughes <mhughes@ltr.arizona.edu>

Date: 1/10/02 9:49 AM

To: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>

CC: rbradley@geo.umass.edu, mhughes@ltr.arizona.edu, Neal Grandy <nrg2p@virginia.edu>

I'll ask them to fax to Scott, Malcolm

Subject: Re: help again  
From: Malcolm Hughes <mhughes@ltrr.arizona.edu>  
Date: 6/7/02 5:27 PM  
To: Tom Crowley <tcrowley@duke.edu>, "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>  
CC: Malcolm Hughes <mhughes@ltrr.arizona.edu>

Tom - the reference is:  
NaurzbaevMM, Vaganov EA, 2000. Variation of early summer and annual temperature in east Taymir and Putoran (Siberia) over the last two millennia inferred from tree rings. Journal of Geophysical Research ,105:7317-26.  
and the e-mail addresses of the authors are:  
mukhtar@forest.akadem.ru  
eavaganov@forest.akadem.ru

Cheers, Malcolm

>> Hi Tom,  
>>  
>> Nope, not off hand, but I've forward to Malcolm who can probably help  
>> us...  
>>  
>> mike  
>>  
>> At 02:14 PM 6/7/02 -0400, you wrote:  
>>> >Mike,  
>>>  
>>> >trying to track down the reference to Taimyr Peninsula long TR site  
>>> >-- cant seem to find it - do you by any chance recall where this is  
>>> >from?  
>>>  
>>> >Tom  
>>> >--  
>>> >Thomas J. Crowley  
>>> >Nicholas Professor of Earth Systems Science  
>>> >Dept. of Earth and Ocean Sciences  
>>> >Nicholas School of the Environment and Earth Sciences  
>>> >Box 90227  
>>> >103 Old Chem Building  
>>> >Duke University  
>>> >Durham, NC 27708  
>>>  
>>> >tcrowley@duke.edu  
>>> >919-681-8228  
>>> >919-684-5833 fax

>>  
>>  
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>> -  
>> Professor Michael E. Mann  
>> Department of Environmental Sciences, Clark Hall  
>> University of Virginia  
>> Charlottesville, VA 22903

>>  
>> \_\_\_\_\_  
>> e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434)  
>> 982-2137  
>> http://www.evsc.virginia.edu/faculty/people/mann.shtml  
>>

Subject: Re: question  
From: Malcolm Hughes <mhughes@ltrr.arizona.edu>  
Date: 6/7/02 2:46 PM  
To: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>

Thanks - Malcolm

Subject: Re: sorry-one more change

From: "Malcolm Hughes" <mhughes@ltr.arizona.edu>

Date: 10/23/02 4:52 PM

To: Ray Bradley <rbradley@geo.umass.edu>, Scott Rutherford <srutherford@gso.uri.edu>, Malcolm Hughes <mhughes@ltr.arizona.edu>, "Michael E. Mann" <mann@virginia.edu>

Mike - got back from China a bit later than Ray, taught my class, graded papers, and now plan to work through the redraft and associated docs in the next day or so. Hope this is OK, Cheers, Malcolm Hughes

Professor of Dendrochronology

Laboratory of Tree-Ring Research

University of Arizona

Tucson, AZ 85721

520-621-6470

fax 520-621-8229

Subject: Re: Fwd: 2002JD002532R Decision Letter  
From: Malcolm Hughes <mhughes@ltrr.arizona.edu>  
Date: 11/9/02 1:19 PM  
To: "Michael E. Mann" <mann@virginia.edu>

Mike - congratulations. Malcolm

.

Subject: Re: FYI  
From: Malcolm Hughes <mhughes@ltrr.arizona.edu>  
Date: 11/11/02 6:56 PM  
To: "Michael E. Mann" <mann@virginia.edu>

Mike - many congratulations! Malcolm

>> Dear Friends & Colleagues,

>>

>> Thought you might be interested in this. I just found out about it  
>> today:

>>

>> [http://www.sciam.com/print\\_version.cfm?articleID=00052728-1BFF-1DD0-  
>> A060809EC5880106](http://www.sciam.com/print_version.cfm?articleID=00052728-1BFF-1DD0-A060809EC5880106)

>>

>> (go half way down the page).

>>

>> It will appear in the next issue of Scientific American at the  
>> newstands...

>>

>> mike

>>

>>

>> \_\_\_\_\_  
>> Professor Michael E. Mann

>> Department of Environmental Sciences, Clark Hall

>> University of Virginia

>> Charlottesville, VA 22903

>>

>>

>> \_\_\_\_\_  
>> e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (434) 924-7770 FAX:

>> (434) 982-2137

>> <http://www.evsc.virginia.edu/faculty/people/mann.sht>

>> ml

Subject: Re:  
From: Malcolm Hughes <mhughes@ltrr.arizona.edu>  
Date: 11/12/02 10:46 AM  
To: "Michael E. Mann" <mann@virginia.edu>

Dear Mike - once again, congratulations, and many thanks, Malcolm

>>  
>> Dear Ray, Malcolm,  
>>  
>> Attached is the actual page from Scientific American. Our '98 Nature  
>> article (and all three authors) are recognized for the contribution...

>> mike

>> \_\_\_\_\_  
>> \_\_\_\_\_  
>> Professor Michael E. Mann  
>> Department of Environmental Sciences, Clark Hall  
>> University of Virginia  
>> Charlottesville, VA 22903

>> \_\_\_\_\_  
>> \_\_\_\_\_  
>> e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX:  
>> (434) 982-2137  
>> <http://www.evsc.virginia.edu/faculty/people/mann.sht>  
>> ml

Subject: Re:  
From: Malcolm Hughes <mhughes@ltrr.arizona.edu>  
Date: 11/13/02 10:06 AM  
To: "Michael E. Mann" <mann@virginia.edu>  
CC: ray Bradley <rbradley@geo.umass.edu>

Mike - is this actually out yet? I assume it will be in the December issue. If not, I'd appreciate it if you got a chance to scan the page at a higher resolution - the text in the pdf was unreadable. CHeers, Malcolm

>>  
>> Dear Ray, Malcolm,  
>>  
>> Attached is the actual page from Scientific American. Our '98 Nature  
>> article (and all three authors) are recognized for the contribution...

>>  
>> mike

>>  
>> \_\_\_\_\_  
>> \_\_\_\_\_  
>> Professor Michael E. Mann  
>> Department of Environmental Sciences, Clark Hall  
>> University of Virginia  
>> Charlottesville, VA 22903

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>> (434) 982-2137  
>> <http://www.evsc.virginia.edu/faculty/people/mann.sht>  
>> ml

Subject: Re:  
From: Malcolm Hughes <mhughes@ltr.arizona.edu>  
Date: 11/13/02 7:08 PM  
To: "Michael E. Mann" <mann@virginia.edu>

THanks Mike - yep this version was much clearer. Cheers, Malcolm  
>>  
>> HI Malcolm,  
>>  
>> Don't think it is out just yet. We should be able to purchase copies  
>> at the newstands any day thought.  
>>  
>> I purchased the pdf file directly from Scientific American (\$5) so  
>> can't improve upon it. However, I might have saved it at lower  
>> resolution when I extracted the page I wanted. So here is the full  
>> article as provided by Sci. American.

>>  
>> cheers,  
>>  
>> mike

>> At 10:06 AM 11/13/2002 -0700, you wrote:  
>> Mike - is this actually out yet? I assume it will be in the  
>> December issue. If not, I'd appreciate it if you got a chance to  
>> scan the page at a higher resolution - the text in the pdf was  
>> unreadable. Cheers, Malcolm >> Dear Ray, Malcolm, >> Attached is  
>> the actual page from Scientific American. Our '98 Nature > article  
>> (and all three authors) are recognized for the contribution... >>  
>> mike >

>> \_\_\_\_\_ >  
>> \_\_\_\_\_ > Professor Michael E. Mann > Department of  
>> Environmental Sciences, Clark Hall > University of Virginia >  
>> Charlottesville, VA 22903 >  
>> \_\_\_\_\_ >  
>> \_\_\_\_\_ > e-mail: mann@virginia.edu Phone: (434) 924-7770FAX:  
>> > (434) 982-2137  
>> >http://www.evsc.virginia.edu/faculty/people/mann.sht > ml

>>  
>> Malcolm Hughes  
>> Professor of Dendrochronology  
>> Laboratory of Tree-Ring Research  
>> University of Arizona  
>> Tucson, AZ 85721  
>> 520-621-6470  
>> fax 520-621-8229

>> \_\_\_\_\_  
>> \_\_\_\_\_  
>> Professor Michael E. Mann  
>> Department of Environmental Sciences, Clark Hall  
>> University of Virginia  
>> Charlottesville, VA 22903

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> > (434) 982-2137  
> > <http://www.evsc.virginia.edu/faculty/people/mann.sht>  
> > ml

Subject: update  
From: Malcolm Hughes <mhughes@ltrr.arizona.edu>  
Date: 12/3/02 9:27 PM  
To: mann@virginia.edu

Dear Mike - just checking in. I will not make it to AGU. I just got back from a (not very fruitful) meeting in Japan, and realized that I have a huge backlog of unfulfilled commitments, including the work on our new dataset, so I canned my attendance in order to try to catch up. I will go to EGS, and will be in touch about an abstract probably sometime in the next three weeks before I head off to Europe on Dec 25 for a couple of weeks family stuff.

The one interesting thing about the Japan meeting is that a bunch of borehole types were there, mainly Japanese, but also Cermak and Safanda from the Czech Republic. The latter seems to be a very careful guy, who takes the view that they can't really say anything meaningful about anything other than decadal features in GST in the 20th century and century-scale in the 19th, and nothing before that. Probably not too popular with some of their colleagues.

I really regret not having the chance to meet with you and other folks at AGU, but I decided that I should put a premium on getting some work done rather than talking about old work. I'd be really interested to hear how it all goes. When do you return to Virginia from NYC? Cheers, Malcolm

Subject: borehole paper!

From: "Michael E. Mann" <mann@virginia.edu>

Date: 4/2/03 3:41 PM

To: Scott Rutherford <srutherford@deschutes.gso.uri.edu>, rbradley@geo.umass.edu, mhughes@ltrr.arizona.edu, frank@geo.umass.edu, mann@virginia.edu

Dear All,

I've attached our borehole paper, which is out in the latest JGR. I've also posted it on my website here:

Mann, M.E., Rutherford, S., Bradley, R.S., Hughes, M.K., Keimig, F.T., Optimal Surface Temperature Reconstructions using Terrestrial Borehole Data, Journal of Geophysical Research, 108 (D7), 4203, doi: 10.1029/2002JD002532, 2003

<ftp://holocene.evsc.virginia.edu/pub/mann/borehole-jgr03.pdf>

FYI, I've also attached a related paper that is "in press" in GRL that you might be interested in....

Mike

p.s. Scott--I've sent a separate email to the NGDC folks to let them know the paper is out, and to contact you if they need any further data, etc. from us

---

Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

---

e-mail: [mann@virginia.edu](mailto:mann@virginia.edu) Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Attachments:

gissgst-revised-final.pdf 382 KB

borehole-jgr03.pdf 700 KB

## Optimal surface temperature reconstructions using terrestrial borehole data

Michael E. Mann,<sup>1</sup> Scott Rutherford,<sup>1</sup> Raymond S. Bradley,<sup>2</sup> Malcolm K. Hughes,<sup>3</sup> and Frank T. Keimig<sup>2</sup>

Received 14 May 2002; revised 4 November 2002; accepted 14 January 2003; published 3 April 2003.

[1] We derive an optimal Northern Hemisphere mean surface temperature reconstruction from terrestrial borehole temperature profiles spanning the past five centuries. The pattern of borehole ground surface temperature (GST) reconstructions displays prominent discrepancies with instrumental surface air temperature (SAT) estimates during the 20th century, suggesting the presence of a considerable amount of noise and/or bias in any underlying spatial SAT signal. The vast majority of variance in the borehole dataset is efficiently retained by its two leading eigenvectors. A sizable share of the variance in the first eigenvector appears to be associated with non-SAT related bias in the borehole data. A weak but detectable SAT signal appears to be described by a combination of the first two eigenvectors. Exploiting this eigendecomposition, application of optimal signal estimation methods yields a hemispheric borehole SAT reconstruction that is largely consistent with instrumental data available in past centuries, and is indistinguishable in its major features from several published long-term temperature estimates based on both climate proxy data and model simulations. *INDEX TERMS:* 1620 Global Change: Climate dynamics (3309); 3307 Meteorology and Atmospheric Dynamics: Boundary layer processes; 3344 Meteorology and Atmospheric Dynamics: Paleoclimatology; *KEYWORDS:* Boreholes, Little Ice Age, surface temperature, signal detection, global warming

**Citation:** Mann, M. E., S. Rutherford, R. S. Bradley, M. K. Hughes, and F. T. Keimig. Optimal surface temperature reconstructions using terrestrial borehole data, *J. Geophys. Res.*, 108(D7), 4203, doi:10.1029/2002JD002532, 2003.

### 1. Introduction

[2] Subsurface terrestrial borehole temperature profiles can be used to obtain an estimate of ground surface temperature (GST) changes back in time [Harris and Chapman, 1997; Pollack et al., 1998; Huang et al., 2000; Harris and Chapman, 2001]. An advantage claimed for these estimates over those from traditional proxy climate data (e.g., tree rings, corals, ice cores, and historical documentary records), is that they do not require calibration against independent surface temperature data. Previous estimates of Northern Hemisphere mean GST trends from boreholes indicate a net temperature change of 0.8°C to 1.0°C [Pollack et al., 1998; Huang et al., 2000; Harris and Chapman, 2001] from AD 1500 to present. If such trends in GST are, as is argued in these studies, representative of past trends in surface air temperatures (SATs), then they are in conflict with proxy-based estimates of hemispheric SAT changes [Bradley and Jones,

1993; Jones et al., 1998; Mann et al., 1998; Mann et al., 1999; Mann, 2000; Crowley and Lowery, 2000; Briffa et al., 2001], which typically estimate a net warming of about 0.5°C. The proxy reconstructions appear consistent with model-based, theoretical estimates of Northern Hemisphere mean SAT trends over the past millennium [Free and Robock, 1999; Crowley, 2000; Gerber et al., 2003]. The model estimates, however, depend on the assumed radiative forcing history and the climate sensitivity to this forcing, both of which are uncertain. It has been argued [Huang et al., 2000] that the borehole reconstructions, because they indicate larger temperature trends over the past five centuries, imply a higher climate sensitivity than the other proxy-based reconstructions (though if the assumed forcing history is reliable, it is difficult to rectify this history with the substantial trend in the borehole estimates well before the 20th century when anthropogenic forcing was negligible, and only modest, natural radiative forcing variations were likely to play any role [see, e.g., Crowley, 2000]). It is thus important to resolve apparent discrepancies between competing estimates of past temperature change both to resolve uncertainties in the past climate trends, and to better constrain the roles of natural and anthropogenic climate factors in governing past changes.

[3] Contributions to the borehole thermal profile from factors unrelated to GST changes, such as subsurface fluid flow, vertical and lateral inhomogeneities in bedrock proper-

<sup>1</sup>Department of Environmental Sciences, University of Virginia, Charlottesville, Virginia, USA.

<sup>2</sup>Department of Geosciences, University of Massachusetts, Amherst, Massachusetts, USA.

<sup>3</sup>Laboratory of Tree-Ring Research, University of Arizona, Tucson, Arizona, USA.

ties, and variable topography can lead to potentially large errors in individual borehole GST estimates. If such errors are random, they can be reduced (though not eliminated) by averaging many borehole profiles within a particular region. However, other systematic errors or biases that are involved in the attempt to infer past large-scale SAT changes from borehole GST histories cannot be eliminated by simple averaging.

[4] The overwhelming majority of Northern Hemisphere borehole data come from regions that experience seasonal snow cover. The snow cover partially insulates the ground from cold-season air temperature and fluctuations therein, providing a potential insensitivity of the underlying ground temperature to cold winter air mass outbreaks (and implying a warm-season bias in borehole GST estimates, the degree of which depends on extent and duration of winter snow cover). Little, if any imprint, of the cooling associated with cold air outbreaks is recorded by a ground surface buried beneath a sufficiently thick seasonal snow cover layer. The accumulated influence of such outbreaks on winter mean SAT is considerably greater than the quite modest (on the order of a degree C or less) SAT trends sought from borehole reconstructions. In regions where midwinter snow cover has increased over the past few centuries (which could potentially be associated with either warmer or colder winters, depending on the details of air mass influence in the region), borehole GSTs may therefore exhibit a spurious apparent long-term warming (i.e., colder conditions back in time) due to an increasing incidence of insulating winter snow cover in more recent centuries. Such trends in snow cover are, in fact, consistent with inferred climate anomalies during the height of the “Little Ice Age.” Recent work [Keigwin and Pickart, 1999; Shindell *et al.*, 2001], suggests that this period was associated with a tendency for the negative phase of the North Atlantic Oscillation (NAO)/Arctic Oscillation (AO) pattern, implying both colder and dryer conditions over most of the continental interior of North America and Eurasia [e.g., Thompson and Wallace, 2001]. Though the actual past trends in winter snow cover are not known, such indirect inferences are nonetheless suggestive of the possibility of spurious apparent cooling recorded in borehole GST estimates in earlier centuries, when the ground surface may have been subjected to increased exposure to the winter atmosphere. Such influences may indeed largely explain the anomalously cold conditions suggested by borehole temperature reconstructions for the 16th–19th centuries relative to other estimates. General Circulation Model (GCM) experiments are in progress to estimate the potential impacts of changes in seasonal snow cover variability in explaining differential trends in SAT and ground temperature.

[5] Other sources of bias could potentially also be significant. Spring ground warming may be damped and delayed by melting and evaporation of accumulated winter snow cover, and melting of permafrost can lead to complications from related latent heat considerations. Anthropogenic land use changes may further contaminate the surface temperature signal contained in ground temperatures, particularly during the 20th century [Skinner and Majorowicz, 1999]. Additional uncertainty arises in the process of estimating the component of the borehole temperature profile associated with past GST changes, which involves

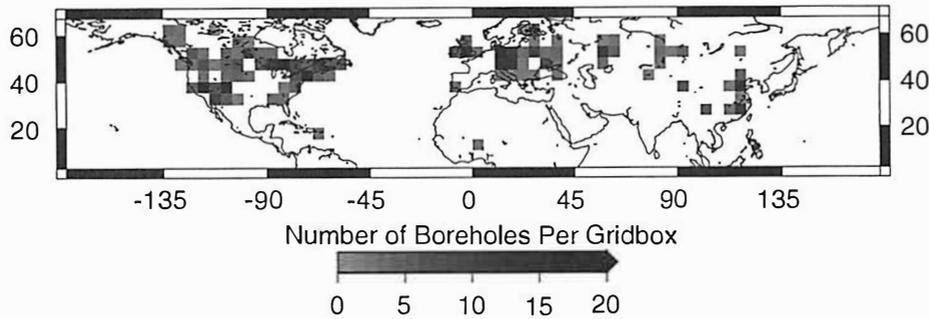
estimating the steady state “background” geothermal flux, which must be removed from the borehole temperature profile to yield a “transient” profile indicative of past GST changes [Harris and Chapman, 1997; Pollack *et al.*, 1998; Huang *et al.*, 2000; Harris and Chapman, 2001]. An incorrect separation of the background and transient components could lead to a systematic bias in the estimated rates of ground temperature change. All of these influences will compromise the relationship between borehole-based GST estimates and the large-scale trends in annual SAT that are of interest.

[6] Huang *et al.* [2000] (HPS00) use a Bayesian inverse method to estimate centennial rates of ground surface temperature change from borehole profiles, integrating these back in time to obtain century-long trends in ground surface temperature trends for the past five centuries at each of 616 borehole sites over the globe. Averaging the 453 individual borehole site temperature reconstructions available over the Northern Hemisphere, HPS00 obtain a reconstruction of Northern Hemisphere mean ground temperature back to AD 1500. Since they reference the mean of their 20th century reconstruction to that of the 20th century instrumental record, any errors in their estimated rates, unless they fortuitously cancel, will lead to an increasing error in temperature estimates back in time. HPS00 argue for a favorable agreement between their mean 20th century trend and the 20th century trend in the (combined land air and sea surface) Northern Hemisphere mean annual surface temperature series (the series represents a hemispheric average of terrestrial SAT data and marine Sea Surface Temperature (SST) data [Jones *et al.*, 1999]). However, important discrepancies are evident upon comparison of their reconstruction with early instrumental SAT data, as well as other long-term proxy-based surface temperature reconstructions, as discussed below.

[7] We show that such apparent discrepancies are an artifact of the contamination of past borehole-based hemispheric temperature estimates by systematic biases such as discussed above. We describe the instrumental and borehole data used in our analysis in section 2. In section 3, we describe the methodology by which the optimal surface temperature signal in the borehole data is identified and reconstructed. We discuss and interpret the results of this analysis in section 4, and present our conclusions in section 5.

## 2. Data

[8] We use the same 453 Northern Hemisphere borehole temperature reconstructions as HPS00 (available at the NOAA World Data Center for Paleoclimatology; <http://www.ngdc.noaa.gov/paleo/paleo.html>). To insure that the information in the borehole and instrumental temperature data sets are represented in a spatially commensurate manner, and that the highly variable spatial sampling density in the individual borehole GST reconstructions does not spatially bias estimates of hemispheric means, we average the individual borehole records onto the  $5^\circ \times 5^\circ$  spatial grid of the instrumental surface temperature data [Jones *et al.*, 1999]. The gridding process yields 94 grid points (out of a total of 1296 required to cover the Northern Hemisphere), with an average of 5 borehole records contributing to each grid point estimate, but with occupancy



**Figure 1.** Distribution of the Northern Hemisphere borehole temperature reconstructions. The locations of the (94) 5° by 5° grid points sampled by the individual borehole reconstructions of HPS00 are shown, along with density of samples contributing to each grid point.

varying spatially from 1 to 22 boreholes per grid point (Figure 1). Nearly identical results are obtained through both simple arithmetic and inverse distance weight grid point estimation schemes, suggesting that the results are robust with respect to the details of the gridding process. We adopt, as approximate estimates of the borehole grid point relative sampling errors, the inverse square root of the number of borehole samples within the grid point (the relative error weights thus vary between 0.21 and 1).

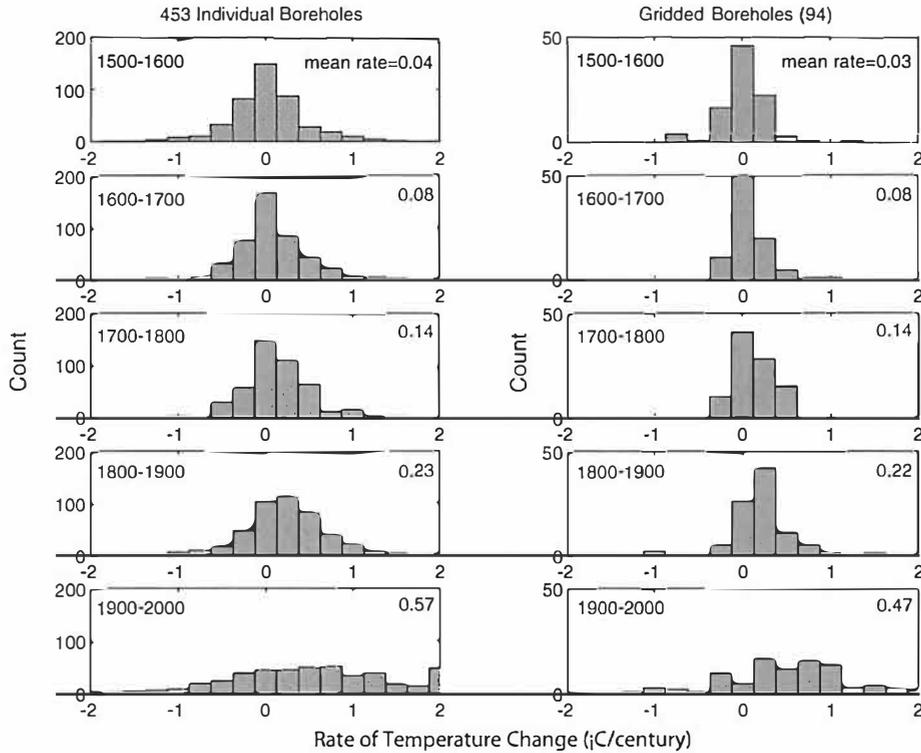
[9] Spatial sampling experiments with the instrumental record suggest that the spatial sampling bias associated with estimating the full Northern Hemisphere mean temperature from the sparse, terrestrial and almost exclusively extratropical grid represented by the boreholes sites is relatively minimal during the 20th century. However, a bias in estimating past hemispheric temperature trends from this limited spatial sampling is likely if, as is suggested from previous work [Mann et al., 2000; Shindell et al., 2001; Hendy et al., 2002; Esper et al., 2002; Mann and Hughes, 2002; Mann, 2002], there are significant differences between extratropical terrestrial and full (ocean and land, tropical and extratropical) hemispheric surface temperature trends in past centuries. The implications of such potential sampling biases, in the estimate of true, full Northern Hemisphere temperature variations in past centuries, is discussed later.

[10] HPS00 use the entire 20th century for comparing instrumental and borehole warming trends. In the context of their analysis, this represents an assumption that the 20th century warming rates measured by boreholes are representative of the entire 20th century. However, the median logging date of the boreholes used in their analysis is 1978. Moreover, since there is some loss of information in the near-surface portion of the borehole profiles, even recently logged borehole records may not record the accelerated observed warming of the past couple of decades. We thus use a more conservative interval 1900–1980 as our standard for comparing borehole and instrumental data, but we also examine the sensitivity to the precise interval over which the data are compared (e.g., 1900–1960; 1900–1980; and 1900–1998).

[11] The noise and bias contributions discussed above contaminate any underlying SAT signal in the borehole data. The individual borehole GST reconstructions of HPS00 exhibit a spatial distribution of positive and negative trends that is statistically indistinguishable from a random distri-

bution for the first three centuries (Figure 2). Such an observation is inconsistent with expectations for actual SAT data, which are known to exhibit considerable spatial coherence and large-scale correlation structure. Only for the 19th century ( $p < 0.20$ ) and 20th century ( $p < 0.05$ ) do the histograms of the individual borehole reconstructions show evidence of such nonrandom spatial structure. The long-term trend constructed by a simple arithmetic averaging of the individual borehole reconstructions, as presented by HPS00, thus represents (at least through 1800) a small residual of larger nearly canceling random trends, and is thus unlikely to represent a meaningful hemispheric SAT history. The century-by-century distributions of the gridded borehole data yields greater evidence of nonrandom spatial structure (Figure 2) though, as discussed below, much of this structure appears to represent bias, rather than an underlying SAT signal. Indeed [see also Briffa and Osborn, 2002], simply gridding the data, prior to averaging over the Northern Hemisphere, and forming an areally representative Northern Hemisphere mean estimate through a cosine latitude weighed mean of the grid point data reduces the amplitude of the long-term trend from approximately 1°C (as in HPS00) to 0.8°C, bringing the estimated change more in line with other proxy-based estimates (Figure 3), though the borehole data still suggest colder conditions in past centuries.

[12] While HPS00 demonstrate a favorable comparison between the 20th century hemispheric mean trend in borehole (1900–1980 roughly) and instrumental temperature (1900–2000) data, a comparison of the spatial patterns in the two datasets indicates prominent discrepancies at collocated grid points (Figure 4), with more than one in four (27/94) of the borehole grid point trends exhibiting the wrong sign trend during the 20th century. A pattern correlation of  $r = 0.09$  (1900–1980) indicates a weak relationship between the spatial information in the two datasets. This conclusion is largely robust with respect to the precise interval over which it is assumed the borehole trends are representative:  $r = 0.11$  for the interval 1900–1998;  $r = 0.15$  for the interval 1900–1960 (the spatial correlations are moderately larger if the grid point GST trends are weighted with respect to their estimated sampling errors:  $r = 0.15$  for 1900–1980;  $r = 0.20$  for 1900–1980;  $r = 0.25$  for 1900–1960). The discrepancy is particularly large over much of North America, when boreholes show greater warming, perhaps due in part to land use changes

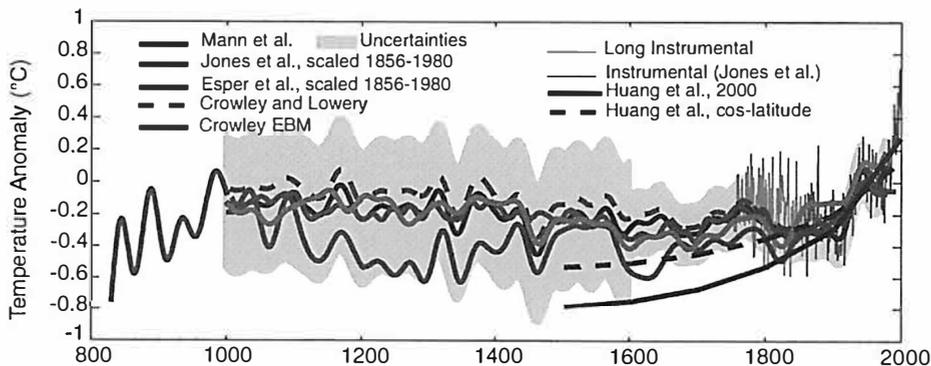


**Figure 2.** Histogram of distribution of trends among the (a) 453 individual and (b) gridded Northern Hemisphere borehole reconstructions for each of the past five centuries. Mean rates of change are indicated for each century in both cases.

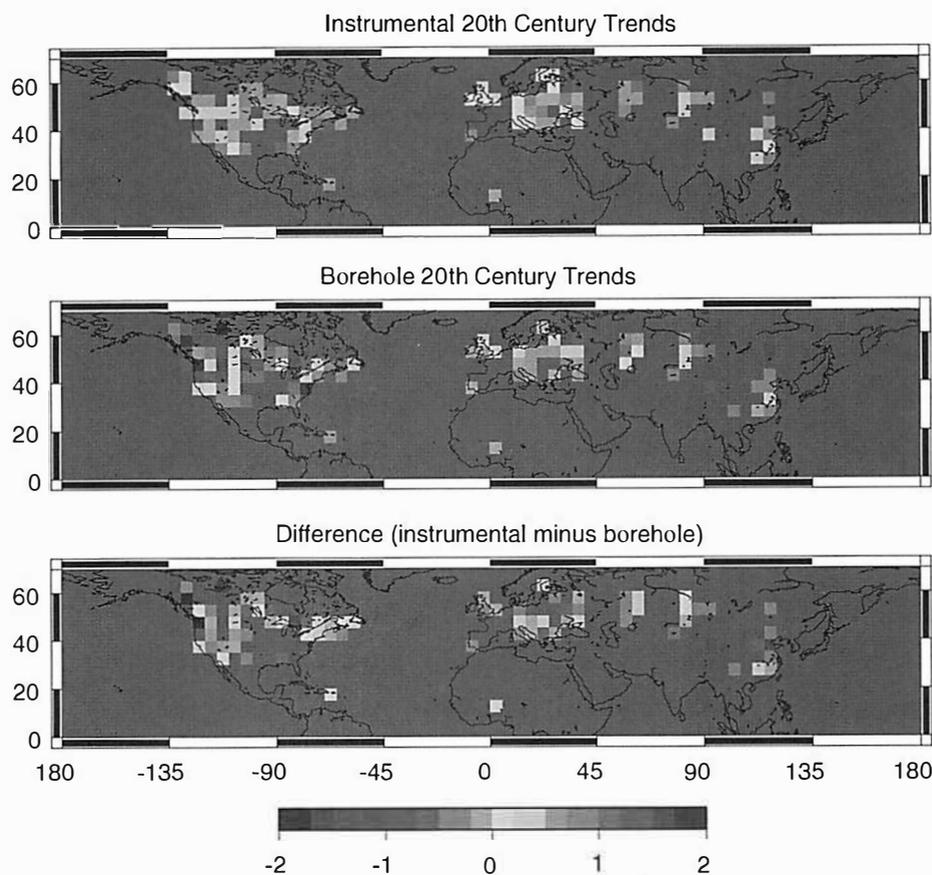
[Skinner and Majorowicz, 1999]. The lack of agreement with regard to the sign of trends for the five highest latitude (Arctic) grid points underscores the added complications in interpreting annual ground surface temperature trends in regions of permafrost and/or extended seasonal snow cover [see, e.g., Beltrami, 1996].

[13] Typical surface temperature correlation-scale estimates [e.g., Briffa and Jones, 1993; Mann and Park, 1994] suggest at most about 15 spatial degrees of freedom at annual timescales in the surface temperature field over the Northern Hemisphere domain sampled by the boreholes, with  $M_{eff} = 6$  or so degrees of freedom at decadal and longer

timescales. Inspection of the patterns of anomalies shown in Figure 4 substantiates such an approximate estimate of spatial degrees of freedom for both the gridded borehole and instrumental surface temperature data. A similarity in the level of spatial coherence of trends between instrumental and borehole data thus exists despite the lack of correlation of the actual spatial patterns of change in the two datasets. The fact that the gridded borehole data are far less spatially random than the individual borehole records (Figure 2) can be attributed to an averaging out of much of the truly spatially random error in the borehole GST measurements on upscaling to the 5° by 5° grid point scale. We thus



**Figure 3.** Comparisons between different Northern Hemisphere temperature reconstructions and instrumental record. Shown are smoothed (40 year lowpassed) reconstructions and, in the case of the Mann et al. reconstruction, the associated 95% confidence interval. Shown for comparison are the HPS00 reconstruction, and the areally weighted mean of gridded HPS00 borehole reconstructions.



**Figure 4.** Comparison of linear 20th century grid point trends 1900–1980 with the (94 grid point) borehole grid mask shown in Figure 1 applied for (a) gridded borehole reconstructions, (b) instrumental surface temperature record, and (c) difference between borehole and instrumental trends. Scales are °C for the instrumental grid point data and nominal °C (based on HPS00 inversion) for the borehole grid point data.

interpret the predominant source of error at the grid point scale and beyond as being associated with nonrandom processes (e.g., seasonal snow cover and land-use influences) that impose intrinsically large-scale patterns of bias in the estimation of SAT trends from borehole-based GST trends. The essential distinction between borehole GST trends (which are themselves uncertain) and SAT estimates derived from those trends (which are likely to be biased for reasons discussed above) has not been given appropriate attention in previous work. We thus choose to be explicit that, while we will henceforth treat the gridded borehole GST reconstructions as estimates of grid point SAT trends, those estimates contain both random uncertainties and systematic biases that must be carefully considered in isolating the weak underlying SAT signal.

[14] The presence of nonrandom, large-scale patterns of bias in borehole-based SAT estimates makes invalid the proposition (e.g., HPS00) that an estimate of hemispheric mean temperature based on an average of hundreds of individual borehole GST reconstructions can provide any significant reduction in the uncertainty in hemispheric mean SAT estimated from the data. Rather, the average of an arbitrarily large number of borehole GST reconstructions over the Northern Hemisphere domain sampled by HPS00 can reduce the error in the hemispheric mean SAT trend

estimate by no more than a factor of  $M_{eff}^{1/2}$ , or, roughly 2.5, relative to the RMS error at the grid point level, regardless of how many individual borehole records contribute to the estimate. The RMS error at the grid point level for the 20th century (note that the RMS errors in previous centuries might be smaller) is readily estimated as approximately 1°C from the mean amplitude of the observed differences between the colocated instrumental and borehole grid point 20th century SAT trend estimates (Figure 4, panel c). Such errors thus preclude reducing the error in a borehole hemispheric mean SAT estimate by simple averaging to less than roughly 1°C/2.5 or 0.4°C, regardless of how many individual borehole records are averaged.

[15] This intrinsic error of 0.4°C is more than 50% of the amplitude of the 20th century trend in the HPS00 reconstruction, and considerably larger than the trend in the HPS00 reconstruction for every century prior to the 20th century. A simple arithmetic mean of either individual or gridded borehole reconstructions thus cannot provide a useful estimate of past hemispheric SAT changes, as it yields trends, which are largely within the intrinsic tolerance of the estimates. A proper estimate of hemispheric surface temperature must therefore identify the weak SAT signal contained within the spatial borehole data, and separate that signal from the contributions of spatial noise and systematic

bias if a meaningful reconstruction is to be expected. We use spatial regression methods to optimally determine this surface temperature signal and its associated uncertainty, as detailed in section 3.

### 3. Methods

[16] We employ a spatial signal detection approach that bears a loose relationship with “optimal detection” approaches used in anthropogenic climate signal fingerprinting [Mitchell *et al.*, 2001]. In such “optimal detection” approaches, one seeks to identify, through generalized linear regression, the estimate of a target signal (as predicted by a model) in empirical data. Detection is accomplished through rotation of the empirical data, in EOF state-space, away from the direction of maximal noise (as estimated from, e.g., a control model simulation). In our approach, an independent estimate of noise is not available. Rather, we employ an EOF rotation of the information in the borehole dataset toward an independent estimate of the target spatial SAT signal from the instrumental record, based on ordinary (potentially weighted) least squares spatial regression. Once an optimal rotation is found that provides maximal (and statistically significant) agreement between the spatial information in the borehole and instrumental record during the 20th century, the associated eigenvector rotation is used to project the estimated borehole SAT signal back in time. An assumption of this approach is that the statistical relationship between borehole GST estimates and the target SAT estimates thereby determined is stationary back in time. While a similar assumption of stationarity is implicit in any attempt at borehole-based SAT reconstruction (e.g., HPS00), such an assumption is not strictly valid if the relative impacts of sources of bias noted earlier (e.g., seasonal snow cover changes) change significantly back in time. Though it is arguably most appropriate to use the borehole grid point GST reconstructions, weighted with respect to the estimated sampling errors, analyses are performed (and results cited) using both the unweighted and weighted data to test the sensitivity of the results to spatial variations in borehole grid point sampling density.

[17] The borehole GST reconstructions can be represented by an  $M \times N$  data matrix  $B$ , where  $M = 94$  spatial grid point estimates,  $N = 6$  time values ( $t = 1500, 1600, 1700, 1800, 1900$ ,  $t_j, t_f = 1960, 1980$ , or 1998 depending on the 20th century borehole GST endpoint assumed). If we wish to work with the error-weighted data matrix, we divide the  $M$  rows of  $B$  by the  $M$  estimated grid point sampling errors discussed earlier. We can expand  $B$  in an empirical orthogonal eigenvector basis set using a conventional singular value decomposition (SVD) of the unnormalized, time-centered data matrix (this is equivalent to performing Principal Component Analysis (PCA) on the data covariance matrix):

$$B = \sum_{k=1}^N \lambda_k u_k^T v_k \quad (1)$$

In this convention,  $\lambda_k^2$  is the relative variance resolved by the  $k$ th eigenvector,  $u_k$  is its normalized spatial pattern (Empirical Orthogonal Function or “EOF”) and  $v_k$  is its normalized temporal pattern (principal component or

“PC”). In this case, the sum extends over  $k = 1, N$  basis empirical eigenvectors. We retain only the first two eigenvectors (see Figure 5), which are the only eigenvectors determined to be statistically significant by the traditional “Rule N” criterion [Preisendorfer, 1988]. These two eigenvectors span the vast majority of the variance (first eigenvector: 82% + second eigenvector: 15% = 97% total) in the sampling-error weighted data, allowing for a useful two-dimensional state-space representation of the SAT signal, noise, and bias information in the borehole dataset [it should be noted that the first and second eigenvector each resolve a similar fraction of variance in the 20th century borehole data, 45% and 38%, respectively]. The corresponding numbers for the unweighted data are extremely similar (first eigenvector: 81% + second eigenvector: 16% = 97% of the total variance, and 46% and 43% of the variance are resolved by the first two eigenvectors, respectively, during the 20th century). Essentially the same results are obtained if the first three eigenvectors are used instead, indicating that the results of the analysis are robust with respect to precisely how many eigenvectors are retained. The eigenspectrum for the EOF decomposition, moreover, is essentially insensitive to whether the 453 individual borehole GST reconstructions, or grid point GST reconstructions, are used.

[18] We find the optimal expression of the pattern of the 20th century surface temperature trend signal within the borehole grid point reconstructions through regressing the spatial information in the two borehole EOF patterns against that in the instrumental record,

$$\hat{I} = a\hat{u}_1 + b\hat{u}_2 + e, \quad (2)$$

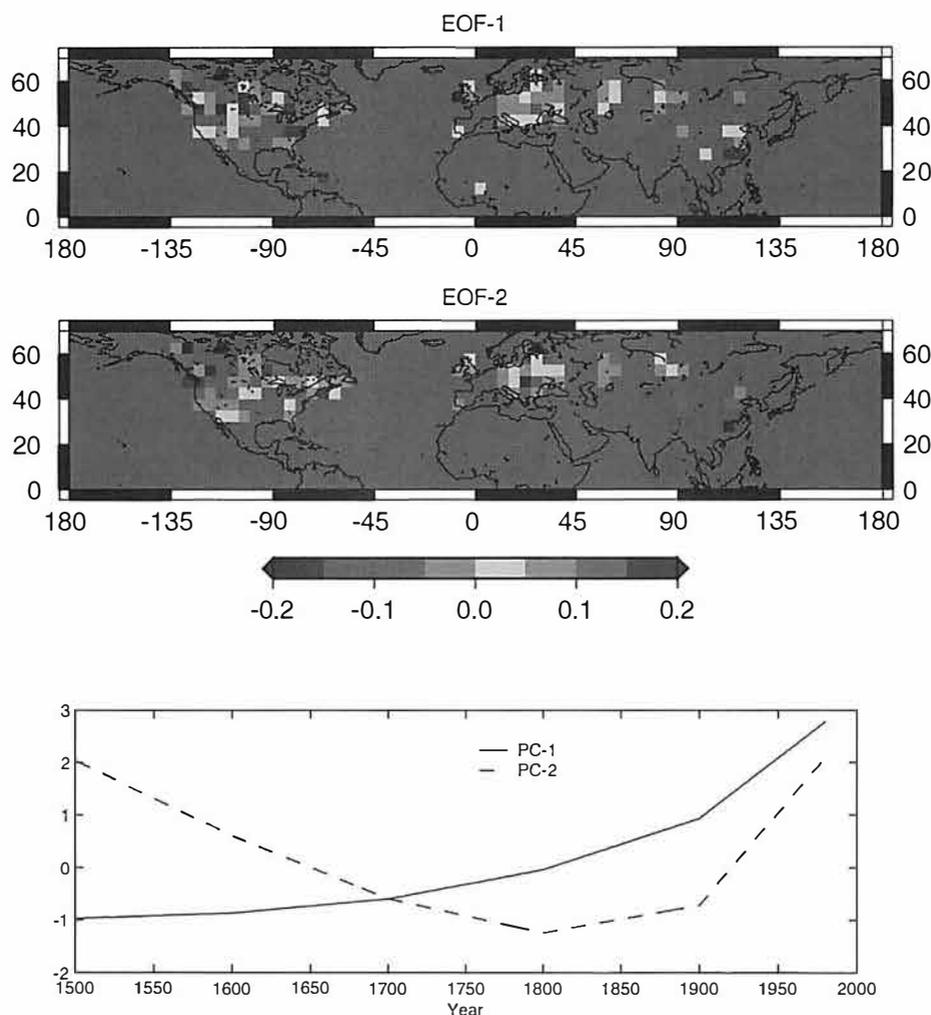
where  $\hat{u}_1$  and  $\hat{u}_2$  are the spatially centered, normalized spatial eigenvectors  $u_1$  and  $u_2$ ,  $\hat{I}$  is the spatially centered, normalized pattern of trend in the 20th century instrumental record,  $a$  and  $b$  are regression coefficients (partial correlation coefficients in this context) and  $e$  is the residual error term. If  $B$  is the sampling error-weighted data matrix, then the procedure represents a weighted linear regression (wherein the statistical sampling error in the borehole grid point estimates is taken into account in the regression, but no sampling error is assumed for the instrumental grid point estimates, an assumption quite consistent with the relative magnitudes of sampling errors in the two data sets).

[19] The residuals  $e$  from this regression are normally distributed (i.e., they pass a  $\chi$ -squared normality test at  $\alpha = 0.05$ ) and not serially correlated ( $p$ -value for the lag-1 autocorrelation  $> 0.3$ ) so that statistical inferences (e.g., the standard error estimates for the regression coefficients) from a traditional analysis of variance are valid. The angle of rotation in two-dimensional EOF space between the direction of maximum variance in the borehole data (the EOF #1 axis) and the optimal estimate of the target-warming pattern is given by

$$\phi = \tan^{-1}(b/a). \quad (3)$$

The optimal estimate of the surface temperature signal component of the borehole data matrix  $B$  is then simply given by the rotation in two-dimensional EOF space:

$$\underline{B} = \cos\phi\lambda_1 u_1^T v_1 + \sin\phi\lambda_2 u_2^T v_2, \quad (4)$$



**Figure 5.** Spatial and temporal patterns for the two leading eigenvectors of the error-weighted gridded borehole data. The spatial patterns (EOF #1 and EOF #2) are shown in Figure 5a and 5b, while their trends from 1500–1980 are described by their corresponding Principal Component (PC) time series (Figure 5c). The patterns have been unweighted by the associated inverse sampling errors for purpose of display.

where  $\underline{B}$  is an  $M \times N$  matrix containing the estimated SAT signal in  $\underline{B}$ . If  $\underline{B}$  was the error-weighted data matrix, then the SAT reconstruction is obtained by dividing the rows of  $\underline{B}$  through by the grid point sampling errors. An areally weighted average of the  $M$  rows of  $\underline{B}$  provides the optimal estimate of the Northern Hemisphere mean surface temperature signal, with the residual variance interpreted as a combination of noise and bias. The uncertainties in the optimal reconstruction are readily determined from the standard errors in the regression coefficients in equation (2) which translate to uncertainties in the rotation described by equation (4).

[20] If the contribution of noise and bias were small, one would expect the optimal projection to yield  $\Phi \approx 0$  (i.e., the surface temperature signal would lie along EOF #1 axis, the direction of maximum variance in the borehole data). We find, however, that the optimal rotation angle is significantly different from zero (i.e., it possesses a significant component along the EOF #2 axis). Using the standard period

1900–1980 to estimate the instrumental trend pattern  $\hat{\mathbf{I}}$  in (2), based on the weighted borehole grid point data, we find an optimal angle of projection of  $\Phi \approx 60^\circ$  degrees in EOF space, associated with a weaker correlation ( $r = a = 0.12$ ) against the EOF #1 pattern than the EOF #2 pattern ( $r = b = 0.22$ ) [the procedure gives  $a = 0.08$  and  $b = 0.14$  for the unweighted borehole data]. The resultant correlation between the instrumental trend pattern and the borehole data projected onto the corresponding optimal rotation axis, though modest ( $r = 0.25$ ), is statistically significant at the  $p = 0.01$  level (we assume a one-sided significance criterion, since a negative spatial correlation between the borehole and instrumental data would be rejected as unphysical). The associated resolved spatial variance, though modest ( $r^2 = 0.06$ ) is significantly greater than that resolved by the un-rotated gridded borehole data (i.e., the square  $r^2 = 0.04$  of the spatial pattern correlation  $r = 0.20$  cited earlier). If  $\hat{\mathbf{I}}$  is determined from the 1900–1998 instrumental record (i.e., the full 20th century, as assumed in the comparisons shown

by HPS00), the optimal projection is essentially along the EOF #2 axis ( $\Phi \approx 66^\circ$ ). If  $\hat{I}$  is determined from the 1900–1960 interval, the optimal signal projection lies roughly along the angle  $\Phi \approx 34^\circ$  in EOF space. For no choice of instrumental interval, however, is the optimal angle of projection near  $\Phi = 0$ . An analysis of the unweighted data yields similar results ( $\Phi \approx 60^\circ$ ,  $\Phi \approx 60^\circ$ , and  $\Phi \approx 15^\circ$ , respectively). The Northern Hemisphere temperature reconstructions resulting from the three different choices of optimal projection interval, for both weighted and unweighted data, as shown later, all lie essentially within the uncertainties estimated for the standard (1900–1980) case. An analysis of the unweighted data yields similar results.

#### 4. Discussion

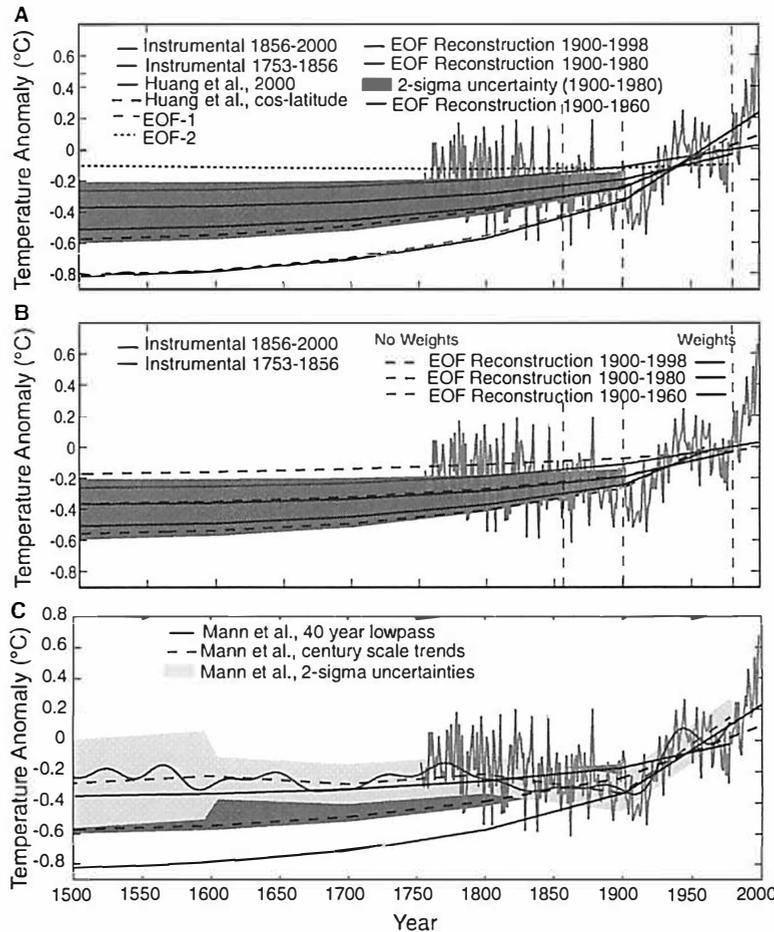
[21] The combination of signal, noise, and bias in the borehole GST reconstructions, as shown above, can efficiently be represented by a two-dimensional phase space spanned by the two leading eigenvectors of the data set. This representation allows us to determine the optimal SAT signal in the borehole GST reconstructions in a relatively straightforward manner. The instrumental surface temperature signal in the borehole data for the standard case (1900–1980 projection interval) is seen to be weakly detectable (i.e., at the  $p = 0.01$  level) and is aligned more closely with the second eigenvector than with the first. This latter observation implies that much of the non-SAT related noise/bias noise variance is associated with the first eigenvector. The first eigenvector closely resembles, in its temporal shape the HPS00 reconstruction, and projects strongly onto hemispheric-mean temperature (Figure 5). Thus, a sizable component of the HPS00 hemispheric mean temperature reconstruction is interpreted as noise/bias, which as discussed above, we speculate may result in large part from changes in seasonal snow cover. However, we emphasize here that we seek simply to isolate the true SAT signal in borehole temperature reconstructions. Determining the ultimate combination of factors leading to the inferred patterns of bias in the data will require further research.

[22] The second eigenvector, by contrast, exhibits a more variable temporal history, with a negative trend from 1500 to 1800, slight increase from 1800 to 1900, and a large positive trend from 1900 to the present. The more heterogeneous spatial pattern associated with the second eigenvector, moreover, nearly vanishes in the hemispheric mean (Figure 5). Thus, the small component of signal that is aligned with the EOF #1 axis nevertheless dominates the optimally estimated hemispheric-mean SAT signal. In contrast, the signal contribution from the EOF #2 pattern, associated with a spatially variable pattern of warming and cooling, largely cancels in the hemispheric mean. The optimal borehole SAT reconstruction thus exhibits significantly less cooling back in time than, for example, the HPS00 reconstruction because the estimated SAT signal projects in large part onto a pattern of zero hemispheric-mean temperature change.

[23] The optimal borehole SAT reconstruction for the standard case (1900–1980 projection interval) exhibits a hemispheric mean trend back in time that is considerably reduced in amplitude relative not only to the HPS00 mean

reconstruction, but even to the smaller trend resulting from the areally weighted mean of the gridded HPS00 borehole GST reconstructions (Figure 6). A similar conclusion is reached regardless of the precise projection interval, though the reconstruction based on the 1900–1960 projection interval yields a trend that is only slightly reduced relative to the areally weighted gridded borehole mean reconstruction. While the analysis of the weighted borehole data is favored, we note that the results are relatively similar for the unweighted data. Use of the weighted data changes the reconstruction for the standard projection interval (1900–1980) little, but brings the reconstructions corresponding to other two projection intervals (1900–1960 and 1900–1998) into better common agreement (Figure 6b), and into better agreement with other long-term hemispheric temperature estimates. As the surface temperature signal is only weakly detected in the borehole data, the borehole temperature reconstruction necessarily exhibits sizable uncertainties. The optimal borehole hemispheric temperature reconstruction for the standard case is well within mutual uncertainty estimates of the *Mann et al.* [1999] proxy-based annual Northern Hemisphere surface temperature reconstruction which is shown both as a smoothed annual record, and as piecewise continuous century-scale trends (with associated uncertainties), to allow for a proper comparison with the centennial resolution borehole estimates (Figure 6c). The HPS00 estimate, however, is inconsistent not only with both of these reconstructions, within estimated uncertainties, but also with the available instrumental Northern Hemisphere mean annual temperature series back through the mid 18th century (Figure 6c) (The extension of the instrumental Northern Hemisphere annual mean temperature record prior to the mid 19th century is based on a composite of the available instrumental SAT series in Europe and North America (13 available back to 1820, 9 back to 1777, 6 back to 1762, and 4 back to 1753) standardized to have the same mean and standard deviation as the full instrumental NH record of *Jones et al.* [1999] over an 1856–present overlap interval. The correlation with the full series during the overlap interval is  $r = 0.45$ .)

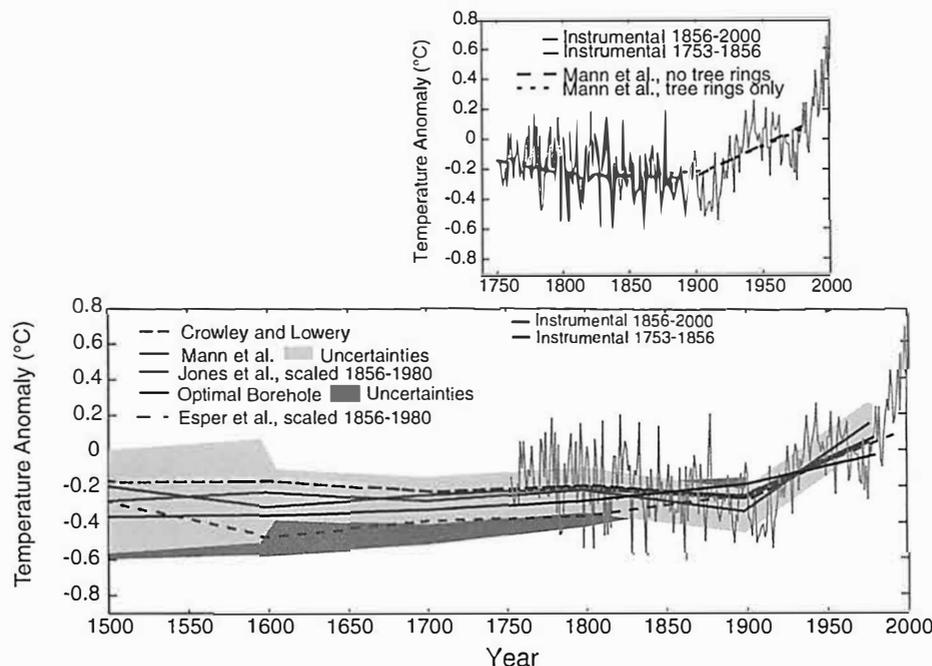
[24] There has been considerable recent discussion [e.g., *Esper et al.*, 2002; *Briffa and Osborn*, 2002; *Mann and Hughes*, 2002] of apparent discrepancies between various proxy-based reconstructions of Northern Hemisphere mean temperature spanning roughly the past millennium. Many of these differences appear to be associated simply with the fact that different reconstructions emphasize different seasons and latitudinal ranges in the underlying proxy data and target region for reconstruction [see *Briffa and Osborn*, 2002; *Mann and Hughes*, 2002; *Mann*, 2002]. A comparison of various different reconstructions was shown in Figure 3 including reconstructions of full Northern Hemisphere annual mean temperatures based either on explicit calibration of diverse (tropical and extratropical) proxy data calibrated against the full Northern Hemisphere instrumental surface temperature record [*Mann et al.*, 1999; *Crowley and Lowery*, 2000] or the modeled surface temperature response of the full Northern Hemisphere to estimated radiative forcing changes [*Crowley*, 2000]. Shown also in Figure 3 are records that implicitly represent extratropical (and primarily warm-season) Northern Hemisphere temperature variations [*Jones et al.*, 1998, *Esper et al.*, 2002], but



**Figure 6.** Borehole-based reconstructions of Northern Hemisphere mean temperature compared with instrumental Northern Hemisphere annual mean surface temperature (*Jones et al.* [1999]; light gray) extended to mid 18th century with the available instrumental data (see text; light blue-gray). (a) HPS00 Northern Hemisphere temperature reconstruction compared to areally weighted mean of gridded HPS00 borehole reconstructions, and optimal borehole hemispheric SAT estimate (using 1900–1960, 1900–1980, and 1900–1998 projection intervals). The 95% confidence interval (light green shading) is also shown for the reconstruction corresponding to the 1900–1980 projection interval. Also shown are the separate projections of the first two eigenvectors onto hemispheric mean temperature. (b) Comparison of the optimal borehole SAT estimate for the unweighted and weighted borehole grid point GST reconstructions. (c) Comparison of HPS00 reconstruction, areally weighted mean of gridded HPS00 borehole reconstructions, and the optimal borehole estimate (based on 1900–1980 target instrumental signal; 95% confidence interval also shown) with *Mann et al.* [1999] reconstruction (latter shown both as smoothed (40 year lowpassed) annual values, and piecewise continuous linear trend estimate with its associated 95% confidence interval).

have been rescaled against the annual mean full Northern Hemisphere instrumental surface temperature record of *Jones et al.* [1999] from 1856–1980 to allow direct comparison with the other reconstructions. Using such a convention, any differences between the true Northern Hemisphere estimates and the rescaled extratropical estimates prior to the mid 19th century can be interpreted as indicating a change in the relationship between warm-season extratropical and annual, full Northern Hemisphere mean surface temperature variations prior to that time. Such changes should be expected if the primary influences on hemispheric-mean or global-mean surface temperatures during the pre-anthropogenic era (e.g., solar and volcanic

forcing, and internal variability) are different from those (e.g., anthropogenic forcing) dominating more recent variations. Nearly all of the proxy reconstructions are seen (Figure 3) to be internally consistent (i.e., well within the uncertainties of the Mann et al reconstruction). The *Esper et al.* reconstruction, which indicates cooler temperatures during the early 17th through early 19th centuries, is an exception. The greater cooling indicated in this latter reconstruction may result from enhanced cooling in the Northern Hemisphere continental centers during the height of the “Little Ice Age” [see, e.g., *Shindell et al.*, 2001], most likely associated, in this case, with the enhanced volcanic cooling sampled by continental warm-season sen-



**Figure 7.** Comparison of optimal borehole reconstruction (based on 1900–1980 target instrumental signal; 95% confidence interval shown) with piecewise continuous linear trends fit to various proxy-based hemispheric temperature reconstructions. The *Jones et al.* [1998] and *Esper et al.* [2002] extratropical summer temperature reconstructions have been scaled to the full Northern Hemisphere 1856–1980 annual mean. All other proxy-series shown are based on original published calibrations, but aligned to a 1961–1990 reference period mean. Note that the Mann et al. only tree ring and only nontree ring reconstructions are only available back to 1750 [see *Mann et al.*, 2000].

sitive tree ring data [see *Mann*, 2002]. Such an assertion is bolstered by a striking coincidence between anomalous cold episodes (e.g., late 12th–early 14th, mid 15th, early 17th, and early 19th centuries) and the periods of peak explosive volcanic forcing [e.g., *Crowley*, 2000] over the past 1000 years.

[25] It is instructive, in this context, to compare the borehole temperature reconstructions against the various other reconstructions when represented by their piecewise continuous century-scale trends in a manner directly comparable with the borehole estimates (Figure 7). Shown also in Figure 7 are the trends for the Mann et al. Northern Hemisphere temperature reconstruction based both on proxy data sets consisting of only nontree ring, and only tree ring indicators [*Mann et al.*, 2000]. In all cases, the trends in the proxy reconstructions are consistent with the optimal borehole estimates reported here within indicated uncertainties. In combination with previous regional comparisons of tree ring and borehole reconstructions [*Beltrami et al.*, 1995; *Majorowicz and Skinner*, 2001], these latter comparisons refute the argument [*Broecker*, 2001] that the use of tree ring indicators (carefully screened for low-frequency content as in *Mann et al.* [1998], and in combination with other proxies) leads to any inherent loss of resolution of century-scale climate variability relative to estimates from terrestrial borehole data. It is not necessary to analyze tree ring data with the “RCS” method (as in *Esper et al.* [2002]) to come to this conclusion [see also *Briffa et al.*, 2001].

[26] The optimal borehole hemispheric SAT reconstruction exhibits a slightly colder 16th and early 17th century, than the full Northern Hemisphere proxy reconstructions, and it is observed to be intermediate in its primary features between the *Mann et al.* full Northern Hemisphere temperature reconstruction, and the (appropriately scaled) *Esper et al.* [2002] extratropical Northern Hemisphere temperature reconstruction. This latter observation is consistent with the existence of real, though evidently modest, differences between extratropical and full Northern Hemisphere temperature trends in past centuries as discussed earlier, since the borehole data, like the *Esper et al.* [2002] tree ring data, are almost entirely extratropical in nature. Moreover since many of the borehole sites are at least partially insulated from winter continental SAT variations through seasonal snow cover, they might be expected to exhibit a similar warm-season sampling bias to the *Esper et al.* [2002] reconstruction (though, as discussed before, this bias is likely to be time dependent in the case of the borehole estimates).

### 5. Conclusions

[27] Application of appropriate signal detection techniques to previously published borehole temperature reconstructions yields an estimated SAT signal that is consistent with proxy-based estimates of hemispheric surface temperature changes in past centuries. It is thus incorrect to argue [*Broecker*, 2001] (see also the response by *Bradley et al.*

[2001]) that information from terrestrial boreholes is in conflict with conclusions regarding past hemispheric temperature changes from other proxy-based reconstructions. Rather, reconstructions based on the restricted information contained in borehole data that is consistent with modern SAT data, reinforces conclusions based on other proxy indicators. The analysis presented in this study also highlights the importance of taking into account differences in regional sampling (e.g., extratropical only versus full Northern Hemisphere emphasis) in properly comparing estimates of Northern Hemisphere mean temperature variation in past centuries. Finally, by reconciling the estimates of past temperature change from boreholes and proxy climate indicators, our analysis tends to support low-to-medium range estimates [Crowley, 2000; Gerber *et al.*, 2003] of climate sensitivity.

[28] **Acknowledgments.** The authors acknowledge support for this work from the Earth Systems History Program (NOAA and NSF), and Department of Energy. We gratefully acknowledge the helpful comments of several anonymous reviewers.

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# Ground vs. Surface Air Temperature Trends: Implications for Borehole Surface Temperature Reconstructions

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**Abstract.** We have analyzed the relationship between surface air temperature (SAT), ground surface temperature (GST), and snow cover (SNC) over the terrestrial Northern Hemisphere based on general circulation model (GCM) simulations using GISS modelE forced with the observed SST and radiative forcing changes from 1951-1998. While SAT is the dominant influence on GST during the warm-season, it explains only half of the variance in GST during the cold-season, with SNC and pre-conditioning by prior warm-season SAT also exhibiting a sizeable and, in places, dominant influence. During a period of coincident surface warming and cold-season snowcover decrease in the model (1971-1998), mean GST increases are 0.2°C less than those in SAT, a consequence of greater exposure of the ground surface to winter cold air outbreaks. Interpretations of past SAT trends from borehole-based GST reconstructions may therefore be substantially biased by seasonal influences and snow cover changes.

## 1. Introduction

A complex relationship exists between variations in surface air temperature (SAT) and the temperatures of the underlying ground surface (GST) in terrestrial regions. While SAT variations are driven largely by atmospheric variability, GST is in addition significantly impacted by land-surface and soil properties, vegetation, latent heat sources and sinks, and permafrost distortion [e.g., Beltrami, 1996]. In the cold season, the effects of insulating seasonal snow cover are of primary importance. Understanding how such processes may influence GST changes is important, for example, for understanding changes in the terrestrial carbon cycle in both the future [Stocker et al, 2001] and past [Gerber et al, 2002]. Important apparent discrepancies, moreover, exist between estimates of past surface temperatures from GST estimates derived from terrestrial borehole data, and those derived from other paleoclimate proxy data [Huang et al, 2000; Harris and Chapman, 2001; Folland et al, 2001; Briffa and Osborn, 2002; Mann et al, 2003]. It has recently been suggested [Mann et al, 2003] that differences between proxy-based SAT estimates and borehole-derived GST estimates in past centuries may in large part be explained by the influence of cold-season snow cover on GST in the extratropical regions from which most of the borehole estimates are obtained. Such a bias would imply greater sensitivity of borehole-based SAT estimates to warm-season temperature variations. Moreover, changes in the extent and duration of seasonal snow cover will potentially introduce a time-dependence to this seasonal sampling bias. Evaluating these factors requires an investigation of the processes impacting GST variations and the differences between SAT and GST trends over time.

To investigate such factors, we make use of a climate model simulation of the latter half of the 20th century employing the GISS modelE GCM [Schmidt et al, 2003] which includes large-scale climate forcing, realistic atmospheric variability, snow hydrology, and a representation of surface, vegetation, and sub-surface thermal properties. In the real world, there are further effects that may compromise the interpretation of GST estimates derived from terrestrial borehole data. These include anthropogenic land use changes in particular [e.g. Skinner and Majorowicz, 1999], but also small-scale heterogeneity in soil, land-surface and microclimatic influences [Gosnold et al, 1997] and the complicating influence of geothermal heat flux [e.g., Harris and Chapman, 1997]. Within a climate model simulation, we are able to analyze a 'best case' scenario, in which these complicating factors are not present. Thus any differences found in the model simulations are due entirely to physical differences between the response of GST and SAT to model-generated climate variability. For this reason, discrepancies between actual GST and SAT estimates are almost certain to be greater than those isolated in the simulation examined here.

## 2. Model Description

The horizontal resolution of the model is  $4^\circ \times 5^\circ$  and has 18 layers in the vertical. The physics in the model is similar to that described in Hansen et al [2002]. The land surface model consists of 6 soil layers of varying thickness calculated separately for bare and vegetated ground [Rosenzweig and Abramopolous, 1997]. The vegetation type and fraction is fixed from present day observations [Matthews, 1984]. The snow model is a 3-layer formulation which allows for a varying snow-covered fraction and water percolation [Stieglitz, 1994]. We define GST as the temperature of the uppermost vegetated soil layer, SAT as the surface air temperature (defined as 10m up in this model--variations at e.g. 2m are the same), and SNC is the mean fraction of snow cover in the grid box (mean snow depth also co-varies closely with SNC at seasonal timescales). The forcings applied to the model over the period 1950-1998 are the observed sea surface temperatures and sea ice conditions, variations in well-mixed greenhouse gases, stratospheric ozone, volcanic aerosols, tropospheric ozone, stratospheric water vapor and solar irradiance (as described in Hansen et al [2002]). Global mean temperature trends over this period are well captured by the model. However, regional patterns of climate change (including those in snowcover) differ from observations, particularly since the model does not exhibit any long-term trend in the Northern Hemisphere winter circulation indices [Thomson and Wallace, 2001]. Nonetheless, the modeled relationships between SAT, GST, and SNC are likely to be representative of their real-world analogues.

## 3. Results

We focus on the extratropical terrestrial region of the Northern Hemisphere (latitudes greater than  $30^\circ\text{N}$ ) since this is, for example, the domain over which the vast majority of borehole-based GST estimates come from [e.g. Huang et al, 2000; Harris and Chapman, 2001]. We analyze separately cold-season (Oct-Mar) and warm-season (Apr-Sep) half years. Figure 1 compares the mean extratropical Northern Hemisphere SAT and GST during the two half-year seasons. GST is observed to track concurrent SAT remarkably closely

during the warm-season. By contrast, significant differences between the two quantities are observed during the cold-season. A positive correlation of cold-season GST with cold-season SAT ( $r=0.9$ ) is observed, as is a negative correlation with cold-season snow cover ( $r=-0.6$ ), and a substantial positive correlation ( $r=0.7$ ) with prior warm-season SAT. An association between cold-season GST and prior warm-season SAT is consistent with the preservation of warm-season atmospheric influence due to insulating cold-season snow cover. Cold-season snow cover provides an additional influence on cold-season GST, modulating the exposure of the cold-season ground surface to concurrent cold-season SAT variations.

An appropriate statistical model for cold-season GST ( $G_c$ ) variability thus must consider, at a minimum, the multiple predictors of concurrent cold-season SAT ( $T_c$ ), cold-season SNC ( $S_c$ ), and prior warm-season SAT ( $T_w$ ). There is a clear co-linearity of the predictors at the hemispheric mean scale, each of which exhibit strong trends during the past three decades (patterns of trend shown in Figure 2; mean  $G_c$  increase is  $0.85^\circ\text{C}$ , mean  $T_c$  increase is  $1.0^\circ\text{C}$ , mean winter  $S_c$  decrease is 2% areal coverage). Thus it is not possible to determine the relative influences of  $T_c$ ,  $T_w$ , and  $S_c$  on  $G_c$  simply from a comparison of the hemispheric mean time series. For example, the decrease in recent decades in areal-mean  $S_c$  is likely a result of increased  $T_c$ , and it is thus not possible to simultaneously determine the additional, more subtle, influence of decreases in  $S_c$  on  $G_c$  from hemispheric mean trends alone.

To separate the partial influences of  $T_c$ ,  $S_c$ , and  $T_w$  on  $G_c$ , we performed a multivariate linear regression at each model grid box using the full 48 years of data available from the model simulation,

$$G_c(\phi, \lambda) = \alpha T_c(\phi, \lambda) + \beta S_c(\phi, \lambda) + \gamma T_w(\phi, \lambda) + \varepsilon \quad (1)$$

where  $\phi, \lambda$  refer to the central latitude and longitude of each model grid box. The predictors and predictand were standardized prior to the regression, so that  $\alpha, \beta$ , and  $\gamma$  are partial standardized regression coefficients which specify the partial influence of each of the three predictors, and  $\varepsilon$  is an assumed white noise error term. Standard errors were determined for all regression coefficients.

This analysis yields an areally-weighted mean estimate over the Northern Hemisphere domain analyzed of  $\alpha=0.70$ ,  $\beta=0.4$ ,  $\gamma=0.14$ , which are in the mean significant at the  $p=0.01$ ,  $0.03$ , and  $0.11$  levels respectively (based on a one-sided null hypothesis, since positive relationships between each of the three predictors and the predictand are dictated by physical considerations;  $G_c$  can be assumed to vary positively with  $T_c$ , and  $T_w$ , and also with  $S_c$  since increased snow cover provides greater insulation against cold air outbreaks).  $T_c$  plays a surprisingly modest role in explaining  $G_c$  variations over the period analyzed, resolving less than half (48%) of the total variance therein.  $S_c$  variations resolve an additional 9% and  $T_w$  4% of the total variance in  $G_c$  indicating less important, but still significant explanatory roles at the hemispheric mean scale. The combined variance explained by the three predictors is 61%. By contrast, a parallel analysis for the warm-season indicates that a majority of the variance in GST (78%) is resolved by the single predictor of concurrent warm-

season SAT alone. Additional factors not explicitly considered in our analysis, such as soil moisture effects, latent heat considerations and permafrost changes at higher latitudes, must be responsible for the sizeable residual unexplained variance in  $G_c$ . It is also possible that the influences of  $S_c$  and perhaps  $T_w$  are underestimated by the approximation of linear relationships assumed in the regression analysis, and that the subtle seasonal influences of snowcover on GST may not entirely be captured with cold-season and warm-season half year relationships.

The regression coefficients  $\alpha$ ,  $\beta$ , and  $\gamma$  were used to project the components of the 1971-1998 trend in  $G_c$  (Figure 2a) associated with  $T_c$ ,  $S_c$  and  $T_w$  respectively (Figure 3). Consistent with the results of the multivariate regression, the dominant factor is changes in  $T_c$  which resolve, in the areally-weighted domain mean, 0.65°C of the 0.85°C increase in areally-weighted domain mean  $G_c$ , with the pattern of  $T_c$  warming similar to, but damped relative to, that for  $G_c$ . By contrast,  $S_c$  changes (which in most regions are sizeable, see Figure 2d) impart an areal-mean  $G_c$  cooling trend of 0.2°C. The greatest cooling influence, not surprisingly, is evident in regions (e.g. higher latitudes of North America and Tibetan plateau) where greatest decrease in  $S_c$  are observed (Figure 2d). The close correspondence between the spatial pattern of available borehole temperature estimates [e.g. Huang et al, 2000] and the pattern evident in Figure 2d suggests that the influence of snowcover changes could be especially large in hemispheric estimates formed from the sparse available borehole measurements. An estimated 0.12°C areal-mean warming trend in  $G_c$  is associated with  $T_w$  with greatest apparent influence found, as we would expect, at higher latitudes and elevations where mean cold-season snow cover is greatest. These three influences therefore resolve in combination roughly 0.6°C of the observed hemispheric mean 0.85°C  $G_c$  increase. This leaves 0.25°C of the mean warming unexplained (at least, in a linearly additive) sense, by the factors analyzed.

#### 4. Conclusions

Analysis of a forced climate model simulation employing physically-based representations of land-surface, ground, and hydrological processes indicates that ground surface temperature in the Northern Hemisphere closely tracks surface air temperature only during the warm-season. During the cold-season, snow cover provides an insulating influence of the ground surface from SAT variations. This serves both to exaggerate the influence of warm-season SAT on annual GST variations, and to provide a source of bias in interpreting SAT changes from GST changes, in the face of changing snow cover. Other factors (such as soil moisture changes, seasonal latent heat absorption and/or release, or non-linear interactions between predictors) may also be necessary to explain the remaining variance in cold-season GST variations unresolved by any of the predictors considered in our analysis. We feel that the results of our modeling study are likely to be representative more generally to continental-scale climate changes over the past few centuries.

Proxy-based hemispheric SAT reconstructions indicate roughly 0.2-0.3°C less cooling (relative to modern) during the depths of the so-called Little Ice Age or 'LIA' (e.g., the 16th-17th centuries) than do appropriate hemispheric mean GST

estimates from borehole data [Briffa and Osborn, 2002; Mann et al, 2003]. This difference is reduced essentially to zero when an optimal borehole 'SAT' estimate is determined by eliminating the projections of spatial patterns of variance in the borehole GST estimates that are statistically inconsistent with the instrumental SAT record during the 20th century [and thus indicative of non-SAT related bias--see Mann et al, 2003]. It has been argued that modern land use changes, a factor absent in our model simulation, contribute such a pattern of bias, imparting an anomalous component of 20th century warming in borehole GST estimates over a large part of North America [Skinner and Majorowicz, 1999]. This anomalous GST warming would indeed lead to artificially cold 'LIA' temperature estimates from boreholes, since the borehole estimates of past temperature change are defined relative to a late 20th century GST baseline assumed equal to that of the instrumental SAT record [e.g. Huang et al, 2000; Mann et al, 2003].

The current study suggests that another contributing factor may be the bias inherent in the seasonal sensitivity of GST to SAT variations in the presence of seasonal snowcover. Initial modeling studies suggest less continental precipitation in the 'LIA' owing to a less intense hydrological cycle [Bauer et al, 2003]. The negative phase of the North Atlantic Oscillation (NAO) atmospheric circulation pattern that has been inferred for the 'LIA' [e.g. Shindell et al, 2002] implies a further reduction in winter continental precipitation. Whether or not such changes translate to decreased continental snowcover is, at present, unclear, though long-term transient climate model runs should provide further insight. However, if such changes in snowcover have occurred, they imply anomalous cooling of GST relative to SAT in earlier centuries. The considerable spatial variability in the amplitude of snow cover influences on cold-season GST suggests, moreover, the added likelihood of spatial sampling bias in the estimation of past hemispheric-mean SAT histories from the regionally-sparse available borehole GST estimates.

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**Figure 1.** Comparison of hemispheric mean SAT, GST and SNC series (anomalies relative to 1951-1998 means). Shown are comparisons of (a) warm-season GST (blue) and warm-season SAT (red), (b) cold-season GST (blue), cold-season SAT (red) and (negative) cold-season SNC (green). Scales for GST and SAT are °C (right vertical axis) and scale for SNC is in % change (left vertical axis).

**Figure 2.** Spatial patterns of 1971-1998 trends in (a) cold-season GST ( $G_c$ ), (b) cold-season SAT ( $T_c$ ), (c) the difference ( $T_c - G_c$ ), and (d) cold-season SNC ( $S_c$ ). Color scale indicates trend in °C.

**Figure 3.** Spatial patterns of components of 1971-1998  $G_c$  trend (Figure 2a) associated with (a)  $T_c$ , (b)  $S_c$  and (c)  $T_w$ . Color scale indicates trend in °C.

FIGURE 1

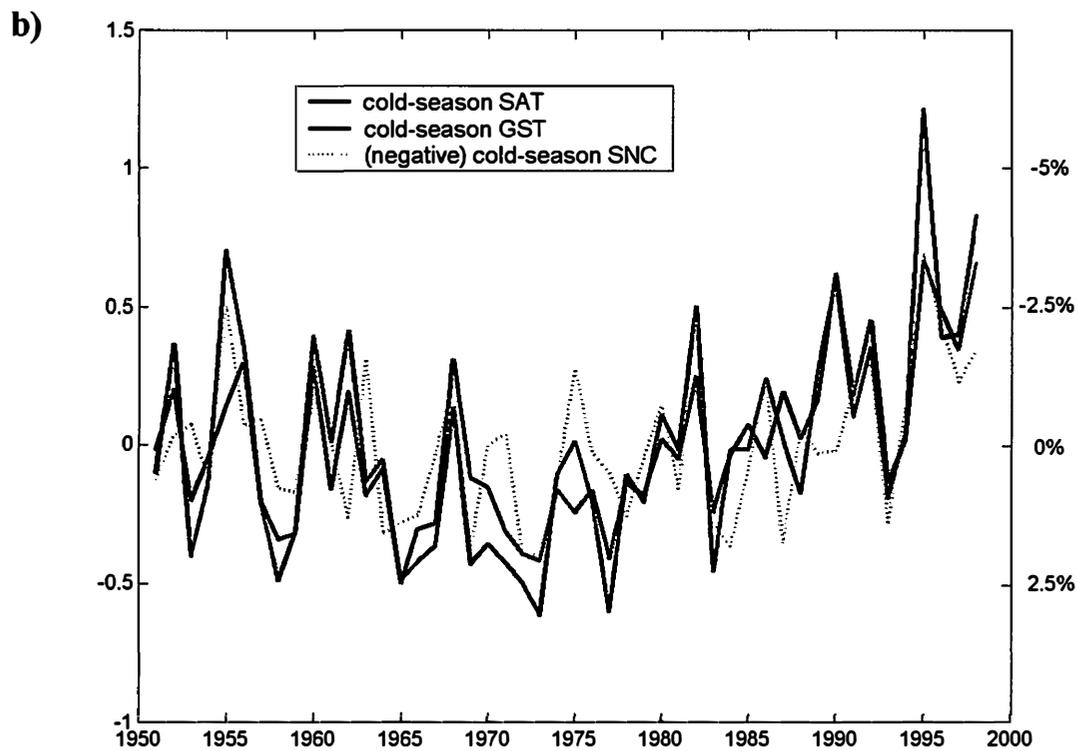
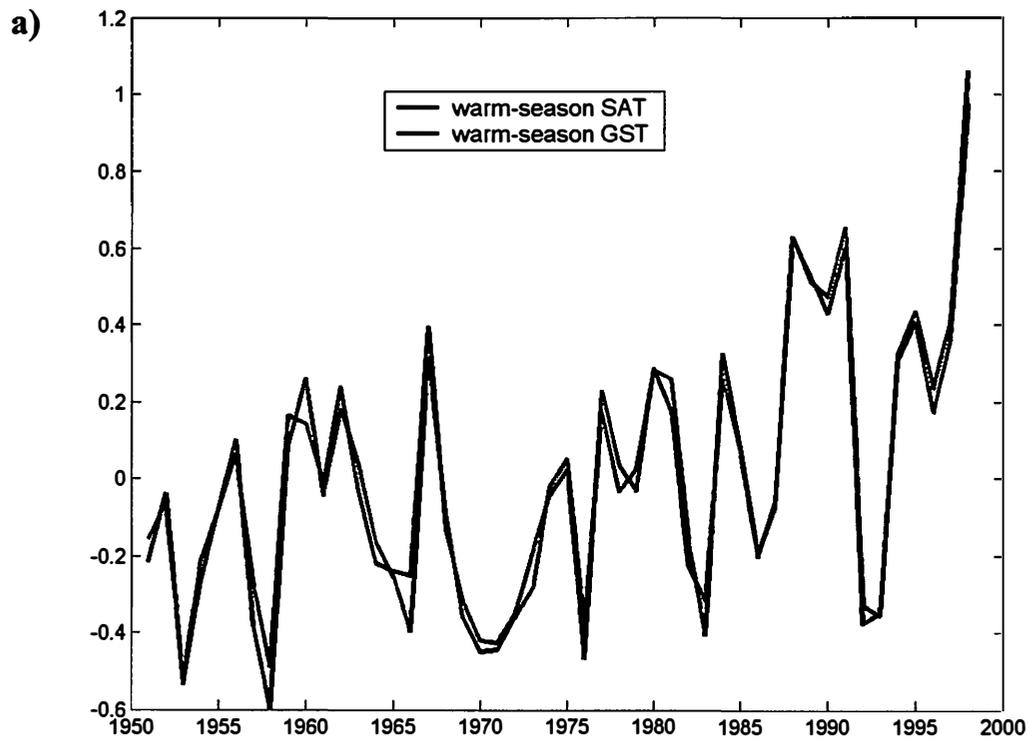


FIGURE 2

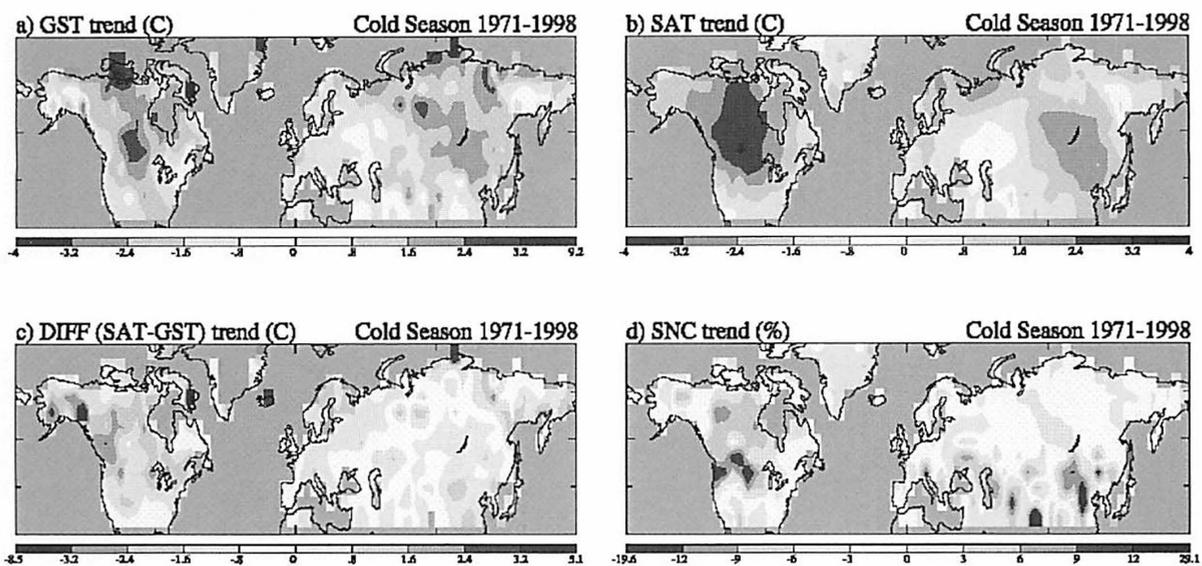
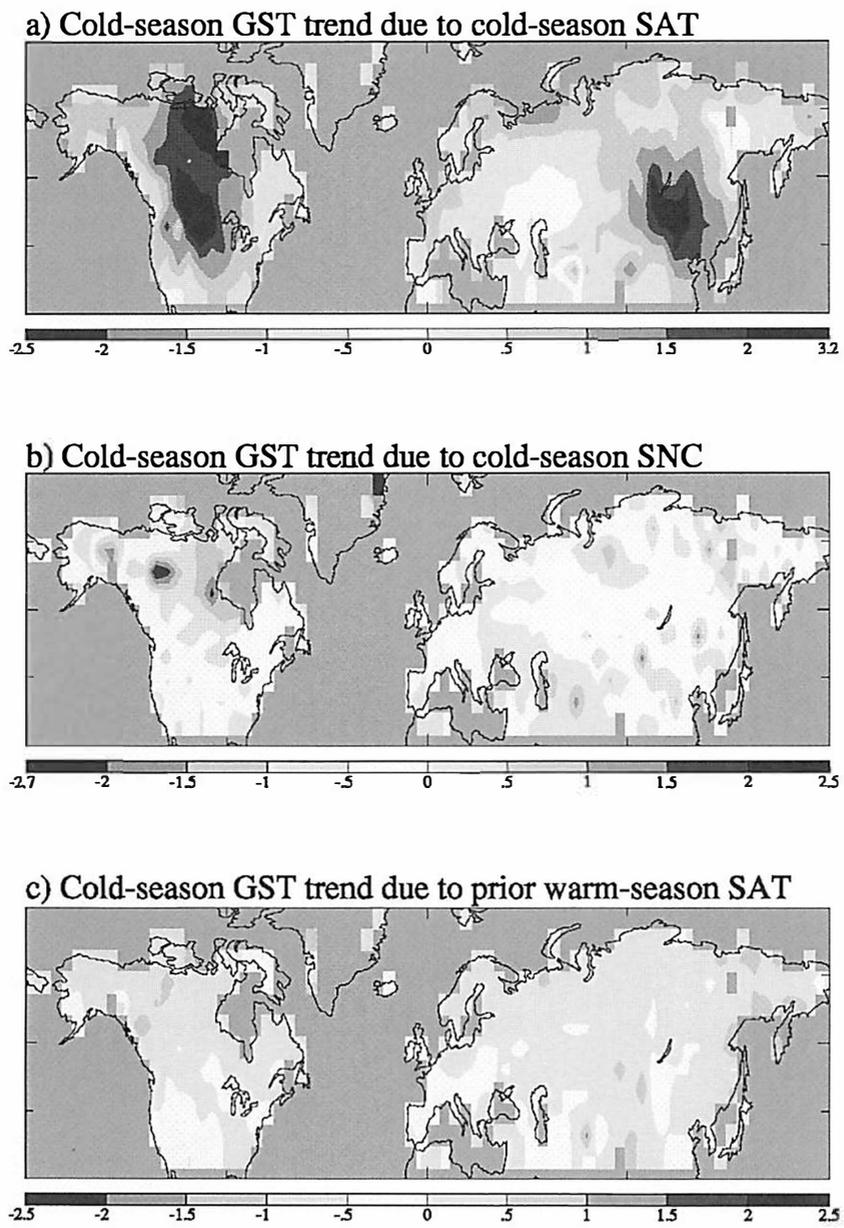


FIGURE 3



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Dear All,

FYI, from the July 12 "New Scientist" (had to wait until they posted it online in their "archive" sans the graphic),

mike

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### Climatologists hit back at greenhouse sceptics

New Scientist vol 179 issue 2403 - 12 July 2003, page 5

THE 1990s were almost certainly the warmest decade for 2000 years. An analysis published this week contradicts recent claims that the Middle Ages were warmer than today. And it reinforces the view that the last quarter-century of global warming has been extremely unusual and therefore down to human activity.

Temperature records taken using thermometers only stretch back 150 years. But palaeoclimatologists are developing a host of ways to push the records back even further. These include measuring the width of annual growth rings in fossil trees from Canada and Mongolia to New Zealand and Patagonia, the chemistry of air pockets in ice cores from Tibet, Peru, Greenland and Antarctica, and biological evidence from lake sediments and fossil shells.

The latest study of these proxy records, to be published in a future issue of *Geophysical Research Letters*, has been carried out by Michael Mann of the University of Virginia at Charlottesville and covers two millennia of temperature records from 13 regions of the world. It extends the period in which the 1990s appear to have been the warmest decade in the northern hemisphere from 1000 to 2000 years and strongly suggests that the same applies to the southern hemisphere. "It becomes increasingly less plausible that natural variability can explain the late-20th-century warming," says Mann.

Not everyone agrees. Earlier this year, Willie Soon of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Massachusetts, gained wide publicity for his claim in the journal *Energy and Environment* that the Middle Ages between 800 and 1300 were warmer than today.

But this week in the journal *Eos*, Mann and other leading British and American palaeoclimatologists argue that Soon's findings are "inconsistent with the preponderance of scientific evidence". During past natural climate anomalies "certain regions tended to warm when other regions cooled", the authors say. By contrast, warming in the late 20th century has been worldwide.



Fred Pearce

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Subject: AP story quoting Bradley  
From: Jonathan Overpeck <jto@u.arizona.edu>  
Date: 7/28/03 10:15 AM  
To: trenbert@ucar.edu, Tom Wigley <wigley@ucar.edu>, Michael Oppenheimer <omichael@Princeton.EDU>, "Michael E. Mann" <mann@virginia.edu>, Jonathan Overpeck <jto@u.arizona.edu>, Caspar M Ammann <ammann@ucar.edu>, Raymond Bradley <rbradley@geo.umass.edu>, Keith Briffa <k.briffa@uea.ac.uk>, Tom Crowley <tcrowley@duke.edu>, Malcolm Hughes <mhughes@ltr.arizona.edu>, Tim Osborn <t.osborn@uea.ac.uk>, Ben Santer <santer1@llnl.gov>, Steve Schneider <shs@stanford.edu>

Hi all - looks like Sir John's not the only one not pulling punches....

>  
>  
>  
> Published on Saturday, July 26, 2003 by the Associated Press  
> Experts at US Conference on Global Warming Say Bush's Position 'Ludicrous'  
> by Scott Sonner  
>  
> RENO, Nevada - International experts at a gathering of more than 1,000  
> scientists studying climate change and the future of mankind say the threat  
> of global warming is real and getting worse.  
>  
> One leading researcher at the weeklong conference said it was 'ludicrous'  
> that the Bush administration has refused to acknowledge the increasing  
> dangers of greenhouse gases.  
>  
> 'The voluntary measures the administration is proposing are going to get us  
> nowhere,' Raymond Bradley said Friday. Bradley is the director of the  
> University of Massachusetts' Climate System Research Center at Amherst,  
> Mass.  
>  
> 'Right now, we have good, strong scientific evidence supported by the vast  
> majority of scientists who studied the problem to say we are facing a  
> serious problem,' he told the Associated Press on Friday.  
>  
> Bradley criticized the White House decision this week to make the study of  
> natural cycles in climate change the chief goal of a new 10-year plan  
> addressing global warming.  
>  
> President Bush and his advisers maintain that reducing emissions through  
> costly near-term measures is unjustified. The White House argues that  
> forecasting climate change is too imprecise to agree to long-term,  
> international, mandatory cuts in greenhouse gas emissions.  
>  
> 'It is only imprecise if you choose to consider what I would describe as  
> fringe science,' Bradley told AP. 'Politicians are always faced with making  
> decisions in the face of uncertainty, but I think the uncertainty over this  
> issue is relatively low.'  
>  
> Bradley co-authored a study of tree rings and ice cores that determined 10  
> of the hottest years globally over the past 600 years have come since 1990 'the  
> hottest in 1998.'

> “We need to put our present state in perspective for politicians and others  
> who are not yet convinced things need to be taken seriously,” he said in a  
> speech Thursday.

>

> “Most of the major developments in this area have taken place in the last 30  
> years,” Bradley said.

>

> “One-half of all the greenhouse gases have been added since I was a grad  
> student,” he said, mostly in the form of emissions from carbon dioxide and  
> methane.

>

> “This change is clearly unprecedented, it is abrupt and it’s of a magnitude  
> larger than anything we have ever experienced. And whatever we’ve seen in  
> the recent past, those changes are destined to be overshadowed by changes in  
> the near future,” he told the International Union for Quaternary Research.  
> INQUA was formed in 1928 by scientists seeking to understand environmental  
> changes on Earth since the Quaternary Period, which spans approximately the  
> past 2 million years.

>

> Other papers presented at the conference include the findings of James Knox  
> of the University of Wisconsin “that flooding of the Upper Mississippi  
> River over the past 7,000 years was “strongly linked to relatively modest  
> climate changes.”

>

> The high frequency of large floods on the (river) since about 1950 have  
> occurred during a period of rapid global warming, he said.

>

> David Sauchyn of the University of Regina in Saskatchewan said his research  
> suggests global warming could result in Canada’s prairie environment  
> becoming much drier.

>

> U.S. Energy Secretary Spencer Abraham has said the administration is  
> “already engaged in an active, aggressive and multi-pronged campaign to  
> address climate change.”

>

> The new program introduced this week “will find the answers to the many  
> unanswered questions about climate change, and identify the most promising  
> areas for investment in future technology research and development,” he  
> said.

>

> James Schlesinger, former energy secretary under President Carter, said at a  
> recent Energy Department symposium that the idea the “science is settled” on  
> global warming is “far from the truth.”

>

> “We cannot tell how much of the recent warming trend can be attributed to  
> the greenhouse effect and how much to other factors. In climate change, we  
> have only a limited grasp on the overall forces at work,” he said.

>

> Bradley said there were times in history where higher levels of carbon  
> dioxide likely existed.

>

> “But there weren’t 6 billion people living on a knife’s edge when those  
> levels were reached in the past,” he said.

>

- > "For the first time in history, human beings are having a global impact on
- > the most remote parts of the planet. When you go to the South or North pole,
- > you see the evidence of what is happening 10,000 miles away."
- >
- > The INQUA conference, the first in the United States since it met in
- > Colorado in 1965, is hosted by the Desert Research Institute and continues
- > through Wednesday.
- >
- > On the Net:
- > International Union for Quaternary Research Conference:
- > <http://inqua2003.dri.edu/>

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Date: 7/29/03 9:27 PM  
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Attachments:  
Pauling et al 2003.pdf 279 KB

## Evaluation of proxies for European and North Atlantic temperature field reconstructions

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[1] We evaluate the importance of high-resolution proxies for boreal winter (October to March) and summer (April to September) European and North Atlantic temperature reconstructions. Multiple regression, backward elimination and cross-validation techniques are used to achieve this goal. The analysis considers natural proxies and synthetic “pseudo-documentary indices”. The results suggest that the most valuable predictors for European winter temperature are documentary-based indices, while tree-rings performed best for the warm season. It was also shown that the temperature signal in a speleothem from Scotland may be used for further winter and summer temperature reconstructions over parts of the Atlantic Ocean. This study represents a step towards the optimal selection of proxies which will improve temperature reconstructions. *INDEX TERMS:* 1620 Global Change: Climate dynamics (3309); 3344 Meteorology and Atmospheric Dynamics: Paleoclimatology; 4215 Oceanography: General: Climate and interannual variability (3309). *Citation:* Pauling, A., J. Luterbacher, and H. Wanner, Evaluation of proxies for European and North Atlantic temperature field reconstructions, *Geophys. Res. Lett.*, 30(15), 1787, doi:10.1029/2003GL017589, 2003.

### 1. Introduction

[2] In the context of understanding natural climate variability, improving spatio-temporal high-resolution climate reconstructions is a key issue. Reconstruction skill is related to the inherent climate signal within potential predictor datasets. A number of studies [Briffa *et al.* 1988, 2001, 2002; Schweingruber *et al.* 1991] have shown that tree-rings can skillfully reconstruct warm season temperatures for Europe and the adjacent North Atlantic region. ‘Multi-proxy’ networks (comprising natural archives such as ice cores, tree-rings, laminated sediments and corals in combination with long instrumental time series and historical documents) have also been used to estimate spatial European patterns of annual temperature [Guiot 1992; Mann *et al.* 1998]. Recently, proxy-based annually resolved temperature pattern reconstructions were expanded by Mann *et al.* [2000] in order to develop gridded boreal cold (October–March) and warm (April–September) temperature estimates

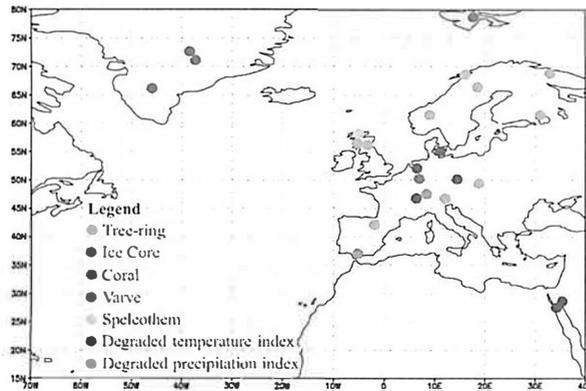
for Europe back to the mid-18th century. The multiproxy approach exploits the complementary strengths from each of the proxies to estimate temperature changes over a large area back in time [Mann 2002].

[3] However, we are not aware of any study which evaluates high-resolution natural and documentary proxies for seasonal temperature estimates over the North Atlantic-European region. Particularly, this contribution aims to statistically determine the most important proxy at each gridpoint over the North Atlantic-European area and how much of the regional temperature variability they account for.

### 2. Data and Methods

[4] Figure 1 depicts the locations of the proxies used in this study (tree-rings, ice cores, corals, one speleothem, one varve and documentary precipitation and temperature series). Most of the natural proxies have been downloaded from the World Data Center (WDC) for Paleoclimatology, Boulder, Colorado, USA. To select temperature-sensitive trees, European pine and spruce chronologies (ring width and density) north of 55°N or higher than 1500 m.a.s.l. have been screened for high correlation with spatially averaged temperature in the study area (see Figure 1). As only few predictors can enter the multiple regression model, the ten best performers were selected. Additional information on the proxies used is provided in the supplementary electronic material<sup>1</sup>. As documentary indices were not available for the 20th century, monthly resolved indices based on instrumental measurements were degraded using a similar approach as Mann and Rutherford [2002]: Normally-distributed white noise was added to the series to ensure the resulting pseudo-documentary indices have similar quality as documentary indices derived from historical evidence. We have chosen white noise since the bias of two observations one year apart are believed to be uncorrelated. If we assumed the bias to be red, documentary indices would possibly be favored since temperature series are also slightly red in nature. The signal-to-noise ratios of these degraded indices are based

<sup>1</sup> Supporting material is available via Web browser or via Anonymous FTP from <ftp://ftp.agu.org>, directory “apend” (Username “anonymous”, Password “guest”); subdirectories in the ftp site are arranged by paper number. Information on searching and submitting electronic supplements is found at [http://www.agu.org/pubs/csupp\\_about.html](http://www.agu.org/pubs/csupp_about.html).



**Figure 1.** Locations of the proxies used in this study. The spatial coverage of this map corresponds to the temperature grid used as predictand.

on Rácz' [1999] results who found average correlations of 0.56 between monthly temperature indices based on climate history for Hungary and instrumental observations in Budapest between 1780 and 1850. Similar correlations, with varying overlapping periods between documentary and instrumental data, have been found for the Czech Republic [Brázdil and Friedmannová 1994; Brázdil et al. 2003] and Spain [Rodrigo et al. 1999].

[5] The gridded temperature dataset (70°W–40°E; 15°N–80°N, 5° × 5° resolution) from Jones and Moberg [2003] was chosen as the dependent variable. The common period (1871–1974) of both the predictors and the predictands was used for calibration. Since different proxies may record climate conditions at different times of the year, we study the performance of the proxy information for both the boreal cold (October–March) and warm (April–September) season.

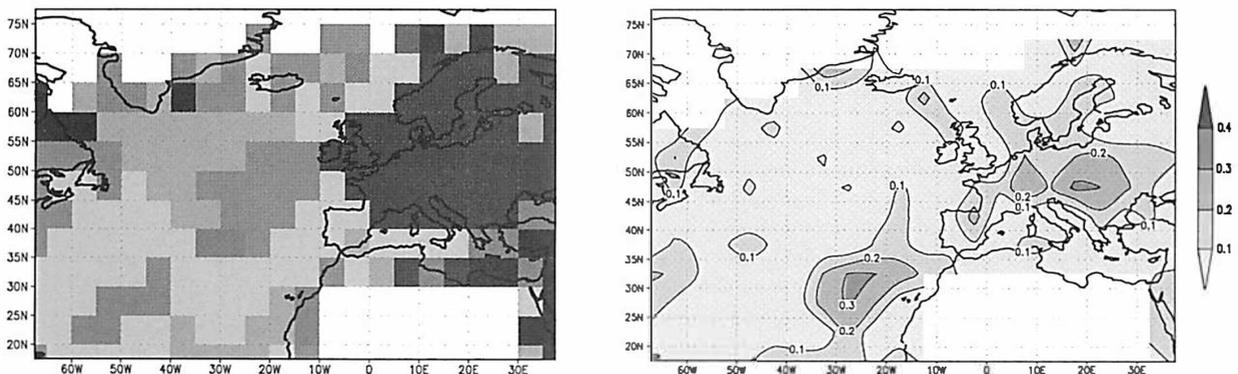
[6] First, for each gridpoint multiple regression models were established. Second, all but one predictor at each gridpoint were eliminated using backward elimination techniques [e.g. Ryan 1997]. The last predictor at each gridpoint is regarded as the most important one of the initial predictor set. To reduce the time-dependence of the calibration equations we used all observations for calibration and performed verification using cross-validation techniques

[e.g. Michaelsen 1987]. To keep autocorrelation between the predicted values and the remaining observations low, we have chosen a “leave-out-three procedure” which runs the model 104 times, each time withholding three different but adjacent observations, and then predicts the middle value of the three that were withheld from the dataset. The result is a time series of predicted values. By correlating this predicted temperature series with the observations the regression model could be verified.

### 3. Results

[7] Figure 2 presents the spatial distribution of the last remaining predictor at each gridpoint for the boreal cold season, derived through backward elimination (left panel) and the corresponding explained variance from cross-validation (right panel). The pseudo-documentary indices are the most important predictors over large parts of continental Europe, explaining approximately 20% of the variance. The speleothem from Scotland proved to perform better in the models than other predictors above all over southern parts of the North Atlantic. It accounts for up to 30% of the cold season's variance. Tree-rings are most important for winter temperature over parts of the central North Atlantic. However, the explained variance is rather low and generally resolves less than 10% of the regional October–March temperature variability. Ice cores are the most important predictors for the cold season temperature around Greenland and over parts of the subtropical Atlantic sharing around 10% of the variance. For only a few gridpoints are the Red Sea corals the best predictor as they appear to represent only regional temperature conditions.

[8] The left panel of Figure 3 shows the most important predictors for the boreal warm season at each gridpoint while the right panel shows the corresponding explained variance from cross-validation. Compared to the cold season, the tree-rings have taken the place of the pseudo-documentary temperature indices (except over Italy). Tree-rings explain between 20% and 40% of the northern European temperature variability. It is mainly density data that correlates strongly with summer temperature. Further, tree-rings are important predictors for temperature over parts of the central Atlantic. As for the cold season, the speleothem is generally the



**Figure 2.** Spatial distribution of the most important predictors for boreal winter (October to March) temperature (left panel). For the legend see Figure 1. The right panel shows the corresponding explained variance from verification. White areas indicate missing data.

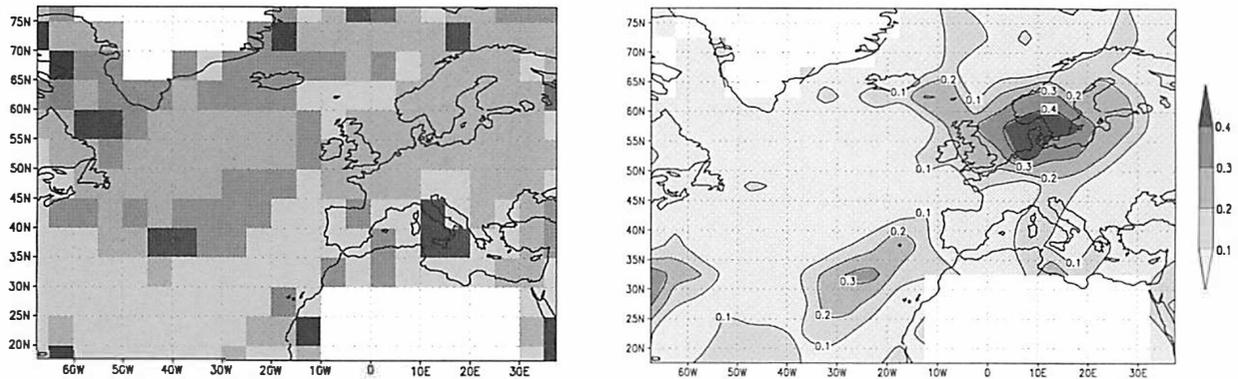


Figure 3. As Figure 2 but for boreal summer (April to September) temperature as predictand.

strongest predictor over the Atlantic south of 40°N with shared variance ranging from below 10% to 30%. The regions where ice cores are most valuable during summer cover similar areas as during the cold season. This proxy accounts for up to 20% of the growing season's temperature variance.

[9] For only very few gridpoints were the varve identified as the strongest predictor. This finding applies only to the used varve and surely cannot be generalized. The relative poor performance of the degraded precipitation indices is possibly due to the weak relationship between temperature and precipitation.

#### 4. Discussion

[10] The results suggest that the integrated summer temperature signal of tree-rings is more accurate than the one derived from historical weather observers (Figure 3). This is not surprising since tree-rings are known to be sensitive to the growing-season [e.g. Briffa et al. 2001, 2002]. However, the pseudo-documentary indices proved to perform better than the other proxies for European winter temperature (Figure 2). A reason for this could be that observers in historical times made direct observations of the weather related to temperature while tree-rings just respire during winter and do not allocate carbon. Correlations between winter temperature and tree-rings are at least partly due to winter-summer temperature correlations.

[11] The areas where the speleothem is the best proxy cover large areas of the North Atlantic Ocean and parts of the bordering land areas in both seasons. Generally, growth of this Scottish speleothem is promoted by warm and dry conditions [Proctor et al. 2000]. Moreover, the observed pattern of explained variance (Figures 2 and 3) has similarities to the correlation pattern between the North Atlantic Oscillation (NAO) and Sea Surface Temperatures (SSTs) reported by Slonosky and Yiou [2002]. Hence, these results suggest that there is a linkage between speleothem growth, SSTs and the NAO. However, Proctor et al. [2002] reported on temporal instabilities in the stalagmite growth rate-SST relationship. We found similar results for air temperature when performing experiments using different calibration/verification intervals in the period 1871-1974 (not shown) revealing that the results presented here are only valid for the 104-year calibration period. If temporal extrapolation is possible needs to be verified. Further, Proctor et al. [2002] found the

highest SST-stalagmite correlation north of Iceland. However, the cross-validated results do not confirm this finding using air temperature despite the SST-air temperature linkage.

[12] The value of the ice cores in reconstructing temperature around Greenland is probably related to the local temperature signal in the  $\delta^{18}\text{O}$  series [Johnsen et al. 1989]. Ice cores are also important predictors for winter temperature over the subtropical North Atlantic. This could be attributed to the importance of this part of the Atlantic as moisture source for the Greenland ice sheet [Johnsen et al. 1989].

[13] Coral  $\delta^{18}\text{O}$  series also reflect SST [e.g. Felis et al. 2000]. The importance of the corals for local winter air temperature (Figure 2, left panel) may be due to the linkage between SST, air temperature and large-scale atmospheric circulation. Interestingly, there is only a winter temperature signal in the  $\delta^{18}\text{O}$  series of the Red Sea corals. We attribute this to enhanced advection of relatively cold air from southeastern Europe over the eastern Mediterranean towards the northern Red Sea region [Rimbu et al. 2001].

[14] It should also be taken into account that not only the proxy type determines the results of this study (Figures 2 and 3) but also its initial number and location. However, especially the speleothem shows that the importance of proxies does not depend on how many proxies of each type entered the backward elimination process. Also, despite the importance of the proxy location, the proximity of tree-rings and the speleothem in Scotland as well as the vicinity of pseudo-documentary indices and tree-rings in central Europe suggest that the proxy characters are competing in the backward elimination process and not the proxy locations.

[15] The analysis was also performed for annual temperature (see the electronic supplementary material<sup>1</sup>). Especially over Central Europe the distribution of the most important predictors is closer to the winter than to the summer pattern. A reason may be that temperature trends are generally stronger in winter than in summer. Mann et al. [2000] reported that the seasonal information in the multiproxy networks allows more effective reconstructions at the annual scale than particular seasonal conditions. In our study we found that there is no substantial difference between the performance of the proxies for a particular season or for annual averages, except for northern Europe (warm season) where a higher fraction of the seasonal variance is calibrated.

[16] We also performed a similar analysis, using the full multiproxy model (i.e. without any backward elimination using all the 27 predictors; see the electronic supplementary

material<sup>1</sup>). The pattern remained more or less the same which indicates that much of the temperature variance can be captured by only few but good predictors. This is supported by Bradley [1996] who concluded from an 'optimum site analysis' using a 1000 year GCM simulation that much of the global temperature can be accounted for by selecting data from only a few sites.

## 5. Conclusions and Outlook

[17] In this study we evaluated the importance of natural and documentary-based proxies for boreal winter and summer temperature reconstructions in the European-North Atlantic region. We found that in both seasons over large parts of the North Atlantic the spatial distribution of the most important proxies and the corresponding fraction of explained temperature variance is similar. Degraded temperature indices with a similar signal/noise ratio as "real" documentary indices proved to be the most important predictors over large areas of continental Europe for winter temperatures while tree-rings are the strongest predictors for the boreal warm season over Europe and parts of the Atlantic and the eastern Mediterranean.

[18] The Scottish speleothem record appears to be a valuable predictor variable for large parts of the North Atlantic and adjacent land areas during both seasons but the explained variance significantly varies over space. These conclusions are only valid for the investigated time period since relationships may change as climate forcings change.

[19] Further, it has been shown that different proxy types have their specific response region, which suggests to use region-specific multiproxy sets in seasonal temperature reconstructions. Therefore, the optimal combination of predictors for each gridpoint should be identified. In order to verify the above conclusions more systematic testing of a larger dataset of proxies is needed, considering additional data from Europe, North America and East Asia.

[20] **Acknowledgments.** The authors would like to thank C. Pfister, L. Rácz, F. Rodrigo, A. van Engelen, G. Koslowski, and R. Glaser for making the documentary data series available. Also, we are grateful to the contributors to the WDC for Paleoclimatology for providing their proxy data and to P. Jones and A. Moberg for the gridded temperature data. Further, we would like to acknowledge B. Zolitschka for the varve series; Erich Lerch for data preparation; and Rob Wilson, F. Gonzáles-Rouco, Oliver Timm, R. Brázdil, and two anonymous reviewers for helpful comments on the manuscript. This work is part of the EU-Project SOAP (Simulations, Observations and Palaeoclimate Data: Climate Variability over the last 500 Years), the Swiss part being funded by the Bundessamt für Bildung und Wissenschaft (BBW) under contract 01.0560. Jürg Luterbacher was supported by the Swiss NCCR Climate programme.

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From: "Michael E. Mann" <mann@virginia.edu>

Date: 8/5/03 2:44 PM

To: Raymond Bradley <rbradley@geo.umass.edu>, Phil Jones <p.jones@uea.ac.uk>, Tom Wigley <wigley@ucar.edu>, mhughes@ltrr.arizona.edu, Michael Oppenheimer <omichael@Princeton.EDU>, Kevin Trenberth <trenbert@ucar.edu>, Scott Rutherford <srutherford@gso.uri.edu>, Stefan Rahmstorf <rahmstorf@pik-potsdam.de>, j.salinger@niwa.co.nz, Gavin Schmidt <gavin@isis.giss.nasa.gov>, Drew Shindell <dshindel@thebes.giss.nasa.gov>, Tom Crowley <tcrowley@duke.edu>, Mike MacCracken <maccrac@comcast.net>, jeffrey.park@yale.edu, dhondt@gso.sun1.gso.uri.edu, Eric Steig <steig@ess.washington.edu>, Tim Osborn <t.osborn@uea.ac.uk>, Keith Briffa <k.briffa@uea.ac.uk>, Caspar M Ammann <ammann@ucar.edu>, Stephen H Schneider <shs@stanford.edu>  
CC: mann@virginia.edu

the transcript is mostly accurate, though the stenographer made a few mis-quotes, typos, etc...

mike

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Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
Charlottesville, VA 22903

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e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137  
<http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Attachments:

transcript-SenateEPW29Jul03.pdf 231 KB

Subject: Re: seminar dates  
From: Malcolm Hughes <mhughes@lrr.arizona.edu>  
Date: 9/12/03 5:26 PM  
To: "Michael E. Mann" <mann@virginia.edu>  
CC: mann@virginia.edu

hi mIKE - HOW ABOUT mARCH 18? cHEERS, mALCOLM> HI Malcolm,  
>>  
>> Here are the possible dates (I've eliminated three dates: Feb 26,  
>> since I'll be at CLIVAR workshop, and March 25 when I'll be at GSA  
>> meeting in DC, and April 8 which is when your Tucson meeting happens I  
>> think).  
>>  
>> The remaining possible dates are Jan 22, 29, Feb 5, 12, 19, Mar 4, 18,  
>> 25, Apr1, 15, 22).  
>>  
>> Let me know which looks the best and I'll reserve it...  
>>  
>> hope you have a good weekend,  
>>  
>> mike  
>>  
>>  
>>  
>> \_\_\_\_\_  
>> Professor Michael E. Mann  
>> Department of Environmental Sciences, Clark Hall  
>> University of Virginia  
>> Charlottesville, VA 22903  
>>  
>> \_\_\_\_\_  
>> \_ e-mail: mann@virginia.edu Phone: (434) 924-7770 FAX: (434) 982-2137  
>> <http://www.evsc.virginia.edu/faculty/people/mann.shtml>

Subject: April meeting in Tucson  
From: Malcolm Hughes <mhughes@ltrr.arizona.edu>  
Date: 10/22/03 11:35 AM  
To: mann@virginia.edu

Dear Mike,

We are now at the stage of trying to nail down the main slots in the program (First Circular attached to jog your memory) for the meeting to be held in Tucson next April 6-9. We are very keen to have you involved as a major speaker in Session 7: " Dendroclimatology at hemispheric and global scales: results and challenges".

The main objectives of the meeting are " to review and synthesize the results of the last 30 years, and to identify the strengths, weaknesses, needs and opportunities of dendroclimatology".

In more detail, we hope Session 7, and the book contributions arising from it, will address:

"What are the achievements of dendroclimatology as applied at hemispheric and global scales " climate patterns, circulation indices and large-scale means?

What are the limitations of this approach? How might they be overcome?"

This is clearly not a job for dendrochronologists alone, and we really need input from distinguished climatologists (i.e. you) if this exercise is to have any value. We are, of course seeking the participation of other climatologists in various of the sessions we plan. You, however, occupy a very special place because of your own contributions to the objective use of tree-ring data on very large spatial scales. We (Tom Swetnam, Henry Diaz and myself) see Session 7 as a 'Grand Finale', and I hope that the progression leading up to this is clear from the First Circular.

I very much hope that you will agree to do this. Of course, we would be able to cover your travel, accommodation and subsistence costs to the extent necessary. If you have any questions, I'll do my best to answer them.

Cheers, Malcolm

Attachments:

D:\Projects\Fritts symposium\First circular.rtf

Subject: Re: title  
From: Malcolm Hughes <mhughes@ltrr.arizona.edu>  
Date: 10/22/03 8:41 PM  
To: "Michael E. Mann" <mann@multiproxy.evsc.virginia.edu>

Hi Mike - I like the Nature paper - congratulations to you all. As for the title for my talk, How about: "The wise use of tree-rings as records of past climate: myths and distractions?"

Let me know if this sounds a bit too argumentative. Cheers, Malcolm

>> Hi Malcolm,

>>

>> Can you send me a title for your seminar here this spring? Thanks,

>>

>> mike

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Professor Michael E. Mann  
Department of Environmental Sciences, Clark Hall  
University of Virginia  
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>> 982-2137

>> <http://www.evsc.virginia.edu/faculty/people/mann.shtml>

>>

Subject: Stradivarius

From: "raymond s. bradley" <rbradley@geo.umass.edu>

Date: 12/8/03 8:54 AM

To: dianna@geo.umass.edu, bethc@geo.umass.edu, caitlinm@geo.umass.edu, jshakun@geo.umass.edu, frank@geo.umass.edu, bradbury@geo.umass.edu, mhughes@ltrr.arizona.edu, mann@multiproxy.evsc.virginia.edu

CC: rbradley@geo.umass.edu

Cool weather may be Stradivarius' secret

Monday, December 8, 2003 Posted: 9:18 AM EST (1418 GMT)

2d90ea.jpg

2d9119.jpg

Dr. Henri Grissino-Mayer, a tree-ring expert at the University of Tennessee, poses with a sample from what was believed to be the oldest white oak tree in Tennessee, dating to 1763.

KNOXVILLE, Tennessee (AP) -- The secret of a Stradivarius violin's heavenly sound may actually have celestial origins.

For centuries, experts have debated whether special varnishes or wood treatments were the secret to the instruments' rich resonance, which some consider superior to contemporary violins.

Now a tree-ring dating expert at the University of Tennessee and a climatologist at Columbia University offer a new theory -- the wood developed special acoustic properties as it was growing because of an extended period of long winters and cool summers.

"It just amazed me that no one had thought of this before," said Dr. Henri Grissino-Mayer. "The relationship between the violins, the trees that they were made from, the climate that existed when the trees grew and how it affected wood density to create a superior tonal quality.

"It just started clicking, and I thought, 'Oh, we are on to something,'" he said.

Grissino-Mayer at Tennessee and Dr. Lloyd Burckle at Columbia suggest a "Little Ice Age" that gripped Europe from the mid-1400s until the mid-1800s slowed tree growth and yielded uncommonly dense Alpine spruce for Antonio Stradivari and other famous 17th century Italian violinmakers.

The ice age reached its coldest point during a 70-year period from 1645-1715 known as the Maunder Minimum, which was named after the 19th century solar astronomer, E.W. Maunder, who documented a lack of solar activity during the period.

Stradivari was born a year before the Maunder Minimum began, and he produced his most prized and valued stringed instruments as the period ended -- his "golden period" from 1700-1720.

Burckle, who studies global climate change through the lives of tiny sea creatures at Columbia's Lamont-Doherty Earth Observatory in Palisades, New York, compared the dates and wondered if there was a connection.

He contacted Grissino-Mayer, a dendrochronologist at Tennessee's Laboratory of Tree-Ring Science who two years ago authenticated the world's most venerated Stradivarius violin, known as "The Messiah," in England.

Grissino-Mayer developed a 500-year chronology, from 1500 to the present, for 16 high-elevation forests of larch, spruce and pine in five countries from western France to southern Germany. He discovered an unprecedented period of slow growth from 1625-1720 characterized by compact, narrow tree rings.

"We would suggest that the narrow tree rings that identify the Maunder Minimum in Europe played a role in the enhanced sound quality of instruments produced by the Cremona [Italy] violinmakers," Grissino-Mayer and Burckle write, noting that "narrow tree rings would not only strengthen the violin but would increase the wood's density."

"The onset of the Maunder Minimum at a time when the skills of the Cremonese violinmakers reached their zenith perhaps made the difference in the violin's tone and brilliance," they conclude.

Grissino-Mayer and Burckle published their findings in the obscure scientific journal "Dendrochronologia" in July. Their conclusions are only now beginning to circulate.

"I think it is very, very interesting, and it seems to me a valid observation," said Helen Hayes, president of the New York-based Violin Society of America, which hired Grissino-Mayer to examine "The Messiah."

"But on the other hand, nobody in this field ... would ever say that if you put the best wood in the world in the hands of a mediocre maker that you would get a good instrument," she said. "So it is never a complete explanation. Nor is the varnish nor any of the other things they have talked about. I would dare say there is no one piece of the puzzle."

Raymond S. Bradley  
University Distinguished Professor  
Director, Climate System Research Center\*  
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<<http://www.paleoclimate.org>>

Paleoclimatology Book Web Site: <http://www.geo.umass.edu/climate/paleo/html>

2d90ea.jpg

2d9119.jpg

Attachments:

2d90ea.jpg 633 bytes

2d9119.jpg 30.5 KB



(RFP PHOTO)

Subject: Re: Fwd: Mann et al 1998  
From: Malcolm Hughes <mhughes@ltrr.arizona.edu>  
Date: 12/19/03 11:11 AM  
To: "Michael E. Mann" <mann@virginia.edu>  
CC: rbradley@geo.umass.edu

Dear Ray - many thanks for doing this. This morning went completely crazy, with the dishwasher flooding the kitchen and a key jamming in the front door as I try to get to the airport. Now I'm on the way! Cheers and Happy winter solstice, etc. , Malcolm

.

Subject: did you see this?  
From: Malcolm Hughes <mhughes@lrr.arizona.edu>  
Date: 2/9/04 5:58 PM  
To: mann@virginia.edu, rbradley@geo.umass.edu

Looks remarkably similar in theme to the recent Soon et al effort - see attached,  
Cheers, Malcolm

Attachments:  
D:\Projects\Bradley and Mann\controversy\Loehle2004\_EcoModel.pdf

Subject: itinerary  
From: Malcolm Hughes <mhughes@lrr.arizona.edu>  
Date: 2/25/04 9:29 PM  
To: Mann@virginia.edu

Mike - the proposed itinerary has me arriving in Charlottesville at 6pm on March 15 and leaving at 11am on March 19. If this looks like too much of a good thing to you I could come a day later on the 16th. Let me know ASAP. Cheers, Malcolm

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Subject: (Fwd) Walter weighs in  
From: Malcolm Hughes <mhughes@ltrr.arizona.edu>  
Date: 3/16/04 7:31 AM  
To: mann@virginia.edu

----- Forwarded message follows -----

Send reply to: <tswetnam@ltrr.arizona.edu>  
From: "Thomas Swetnam" <tswetnam@ltrr.arizona.edu>  
To: "Julio Betancourt" <jlbetanc@usgs.gov>,  
"Malcolm Hughes" <mhughes@ltrr.arizona.edu>,  
"Henry F Diaz" <Henry.F.Diaz@noaa.gov>  
Subject: Walter weighs in  
Date sent: Mon, 15 Mar 2004 19:37:15 -0700  
Organization: Tree-Ring Lab

Published on Monday, March 15, 2004 by the Philadelphia Inquirer Make  
Global Warming an Issue by Walter Cronkite

The contempt of the Bush administration for environmentalists and their concerns is well known by now. While evidence of man-made environmental damage mounts, the Bush team resists its implications like a defeated army whose rear guard fights off its pursuers as it retreats. That has been especially true of its handling of the most serious of all environmental issues - global warming.

First, the administration claimed that global warming was the work of liberal hysterics and had been discounted by "more sober scientists." Then, it admitted that it was happening but said there was no proof humans caused it, or could fix it.

Retreat No. 3 was the White House discovery that, yes, indeed, some of the warming was due to human activity, and we should take steps, say, to reduce emissions, but those steps should be voluntary on the part of industry.

There are two scientific theories that have been gaining credence in recent years that challenge the sanity of that kind of resistance to fact - and make no mistake about it, global warming is a fact.

Both theories begin with a phenomenon that is taking place right now. Scientists are beginning to understand climate as a complex interactive system that is affected by everything from the emission of greenhouse gases, to deforestation, to the condition of Arctic and Antarctic glaciers.

It is a system with a feedback mechanism. For example, higher temperatures lead to the melting of sea ice, which exposes more water to the sun. The water absorbs more solar energy, which accelerates global warming, and so on. Scientists fear that such feedbacks might produce a self-sustaining and accelerating warming that is beyond human control.

The second theory goes by the name of Abrupt Climate Change. It suggests that catastrophic results of global warming might not occur gradually, as most have expected, but quite suddenly - within a few years. This theory also starts with the melting of glaciers and sea ice, but involves the dilution of seawater's salinity - or salt content - that results. That salt content is a key element in an ocean current that takes heat from the tropics northward and cold water southward and in the process moderates temperatures in the Eastern United States and much of Europe.

The collapse of this so-called conveyor could, in the worst case, produce a new ice age. The best case would give us severe winters, increasingly violent storms, flooding, drought and high winds around the globe, disrupting food production and energy supplies and raising sea levels high enough to flood coastal cities and make them unlivable.

These are not predictions but real possibilities - far more possible today than scientists had previously believed. And while the politicians in the White House continue to stick their heads in the sand, some at the Pentagon have taken on the task of studying the national- security implications of Abrupt Climate Change.

What they came up with was a world whose "carrying capacity" - the number of people the globe can sustain - is being progressively lowered, a world where war becomes the rule, not the exception, and where wars are no longer fought for ideological, religious, or geopolitical reasons - but for resources and survival. This unclassified Pentagon study, completed last fall, has been released to several news organizations and was highlighted in the Feb. 9 edition of Fortune magazine.

One thing we have to keep in mind: While these might only be worst-case scenarios, many of the conditions and processes scientists think might trigger them already are present or under way. Global warming is at least as important as gay marriage or the cost of Social Security. And if it is not seriously debated in the general election, it will measure the irresponsibility of the entire political class. This is an issue that cannot, and must not, be ignored any longer.

Walter Cronkite is a nationally syndicated columnist.

Copyright 1996-2003 Knight Ridder

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----- End of forwarded message -----

Subject: Re: extended abstract, registration form, and problem with hotel reservation  
From: Malcolm Hughes <mhughes@ltrr.arizona.edu>  
Date: 4/1/04 11:42 AM  
To: "Michael E. Mann" <mann@virginia.edu>  
CC: martinez@ltrr.arizona.edu, dendro\_meeting@ltrr.arizona.edu

Dear Mike - this is just to confirm that we will, as requested, be able to reimburse you up to \$500 for travel expenses to the April 6-9 meeting. Sincerely, Malcolm Hughes

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.

Subject: GRL reprint  
From: "raymond s. bradley" <rbradley@geo.umass.edu>  
Date: 9/7/04 6:31 PM  
To: mhughes@lrr.arizona.edu, mann@multiproxy.evsc.virginia.edu, ammann@ucar.edu, dcayan@ucsd.edu, NGraham@hrc-lab.org

with compliments!

Raymond S. Bradley  
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Publications (download .pdf files): <http://www.geo.umass.edu/faculty/bradley/bradleypub.html>

Attachments:

Bradley et al 2004 GRL.pdf 544 KB

Subject: FYI--just out  
From: "raymond s. bradley" <rbradley@geo.umass.edu>  
Date: 10/28/04 7:12 AM  
To: mann@multiproxy.evsc.virginia.edu, srutherford@rwu.edu, mhughes@ltrr.arizona.edu, k.briffa@uea.ac.uk, t.osborn@uea.ac.uk

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Publications (download .pdf files): <http://www.geo.umass.edu/faculty/bradley/bradleypub.html>

**Attachments:**

Beltrami and Bournon 2004.pdf 471 KB

## Projected temperature changes along the American cordillera and the planned GCOS network

Raymond S. Bradley,<sup>1</sup> Frank T. Keimig,<sup>1</sup> and Henry F. Diaz<sup>2</sup>

Received 12 April 2004; revised 24 June 2004; accepted 20 July 2004; published 28 August 2004.

[1] Analysis of 7 GCM simulations with 2x CO<sub>2</sub> levels shows large and statistically significant free air temperature changes (compared to controls) along the axis of the American Cordillera (from Alaska to southern Chile). At all latitudes, the modeled change in temperature increases with elevation. Temperature increases are especially large in boreal summer months from ~35–50°N, and year-round in the high mountains of Peru, Bolivia and northern Chile. If these models are correct, mountain ranges that extend high into the lower troposphere are likely to experience significant warming, with implications for glacier mass balance and water resources, montane ecosystems and high elevation agricultural activities. There are few high elevation meteorological stations to validate the model projections, or to monitor future changes. The planned GCOS (Global Climate Observing System) surface network is not adequate to address the critical issues raised by these model simulations; additional high elevation observing stations are needed. **INDEX TERMS:** 1610 Global Change: Atmosphere (0315, 0325); 3309 Meteorology and Atmospheric Dynamics: Climatology (1620); 9350 Information Related to Geographic Region: North America; 9360 Information Related to Geographic Region: South America. **Citation:** Bradley, R. S., F. T. Keimig, and H. F. Diaz (2004), Projected temperature changes along the American cordillera and the planned GCOS network, *Geophys. Res. Lett.*, 31, L16210, doi:10.1029/2004GL020229.

### 1. Introduction

[2] It is well documented that large temperature changes are likely in polar regions (where temperatures are close to, or below the freezing point) with enhanced levels of greenhouse gases [IPCC, 2001]. What have received less attention are temperature changes in mountain regions of the world, where similarly low temperatures are also recorded. In both regions, warming affects the mass balance of glaciers, the stability of permafrost, the extent and duration of lake ice cover, the growth of trees at their polar or montane limits and the extent and productivity of tundra and other marginal ecosystems [Gottfried *et al.*, 2002]. Furthermore, in many mountain regions in the inter-tropical zone, population density is quite high and upland agriculture is practiced (to over 4000 m in some areas). Glaciers and melting snow are critical water resources for hydro-electric power generation as well as consumptive use in many mountain regions and adjacent lowlands downstream

[Liniger *et al.*, 1998; Mote, 2003; Barnett *et al.*, 2004]. Thus, potential climatic changes in mountain regions are of particular interest.

[3] Models used in the IPCC climate change assessment indicate that, on a zonally averaged basis, the axis of largest mean annual temperature change with doubled CO<sub>2</sub> levels extends from near the surface in the Arctic to the mid-troposphere in the inter-tropical zone. Here, we re-examine these model simulations, focusing on temperature changes in the lower troposphere along the axis of the American Cordillera that extends high into the atmosphere from southern Chile (~50°S) to Alaska (~70°N). We note that these computed temperature changes are in the free air. Surface temperatures are not identical to equivalent free air temperatures (recorded by radiosondes) and the differences may vary diurnally, seasonally and geographically (notwithstanding the fact that radiosonde data are rarely obtained from sites in mountainous regions, so direct comparisons are subject to considerable spatial discrepancies) [Seidel and Free, 2003]. Nevertheless, in the Americas, at least, trends in free air temperatures (such as the height of the freezing level) and trends in surface temperatures over recent decades are generally similar [Diaz and Graham, 1996; Vuille and Bradley, 2000; Diaz *et al.*, 2003; Vuille *et al.*, 2003]. We therefore consider model-derived, projected free air temperature changes as indicative of the changes that are likely to affect surface temperatures along the American Cordillera. This in turn points to those locations where it would be prudent to undertake climate monitoring both for model validation and climate change detection.

### 2. Analysis

[4] We analysed mean monthly temperatures and geopotential heights from seven coupled atmosphere-ocean general circulation models (Table 1) from the CMIP2+ phase of the Coupled Model Intercomparison Project (CMIP) [Covey *et al.*, 2003]. The CMIP2+ model runs include control runs and simulations with 1% per year compound CO<sub>2</sub> increase (over 80 years) in which CO<sub>2</sub> doubles at around year 70.

[5] The spatial domain was a series of 49 (2.5° × 2.5°) grid boxes which run in a transect along the North America/South America Cordillera. Using the ETOPO5 five minute gridded earth topography data (available from NOAA's National Geophysical Data Center) mean elevations were calculated for grid boxes in an area encompassing the Cordillera. Then, for each row of grid boxes, the grid box with maximum mean elevation was chosen. As seen in Figure 1, the chosen boxes form a nearly continuous transect.

[6] For a given model, bilinear interpolation was used to determine the temperature at each grid box for each model

<sup>1</sup>Climate System Research Center, Department of Geosciences, University of Massachusetts, Amherst, Massachusetts, USA.

<sup>2</sup>NOAA/OAR/CDC, Boulder, Colorado, USA.

**Table 1.** CMIP2+ Models Used in the Analysis<sup>a</sup>

Model	Atmospheric Resolution	Number of Vertical Levels	Control Run CO <sub>2</sub> (ppmv)
CGCM2	T32 (3.8° × 3.8°)	17	330
CSM 1.0	T42 (2.8° × 2.8°)	18	355
ECHAM4/OPYC3	T42 (2.8° × 2.8°)	17	353
ECHO-G <sup>b</sup>	T32 (3.8° × 3.8°)	17	353
HadCM2	2.5° × 3.75°	15	322.6
MRI1	T42 (2.8° × 2.8°)	21	345
DOE PCM	T42 (2.8° × 2.8°)	18	355

<sup>a</sup>Atmospheric resolution is expressed either as latitude × longitude or as a spectral truncation with a rough translation to latitude × longitude.

<sup>b</sup>For the ECHO-G increased CO<sub>2</sub> run, there were data for only 78 years, and thus data from years 63 through 78 were used to calculate the means from both ECHO-G runs.

level. Then, using bilinear interpolation with the geopotential heights at each level, the temperature at each grid box was determined for each of the levels from 500 m to 9500 m by 1000 m increments (i.e., 500 m, 1500 m, . . . , 9500 m). Seasonal and annual mean temperatures at those levels were determined for the 61st through the 80th years of both the control runs and the increased CO<sub>2</sub> runs, and then differences between the increased CO<sub>2</sub> run means and the control run means were calculated.

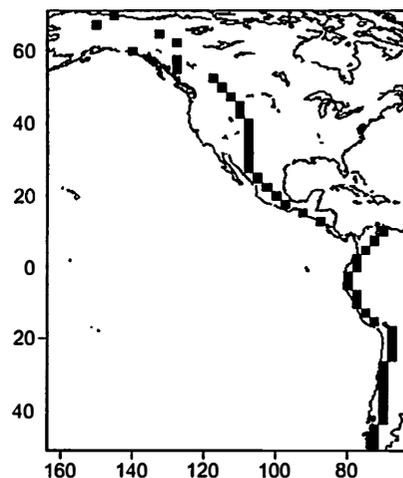
### 3. Results

[7] Figure 2 shows modeled mean annual and seasonal changes in temperature along the America Cordillera transect based on the difference between 2x CO<sub>2</sub> simulations and control runs, averaged for the 7 models (for results from individual models, see auxiliary material<sup>1</sup>). The solid white line shows the maximum 5' × 5' elevation in each grid box. The black triangles show some of the highest mountains in each country along the transect. Thus the area between the white line and the black triangles indicates the highest montane regions that may be impacted by the projected temperature changes. Several models use either sigma (or hybrid sigma) levels, which follow terrain near the surface. For those models there are no data in the lower levels at many grid boxes in the transect. In Figure 2, data are displayed only for those latitudes and levels where data were available from all seven models (missing data are blocked out in white).

[8] At all latitudes, the expected temperature changes increase with elevation. Maximum temperature changes are expected in the mid-upper troposphere (8–10,000+m) in the inter-tropical zone and at the poleward boundary of the Hadley circulation in each hemisphere during summer months in the respective hemisphere. Thus, in boreal summer, warming >3°C is simulated for the high mountains of the Rockies at ~42°N, as well as in the mid-troposphere of the inter-tropical region. In boreal winter months, maximum warming switches to a similar latitude in the southern hemisphere. We interpret this pattern as related to an increase in tropical convection (with associated release of latent heat) and an increase in subsidence at the poleward margins of the Hadley cells [Quan *et al.*, 2004]. As noted in IPCC [2001] models indicate a general increase in precipitation in the intertropical zone and a reduction in sub-tropical regions, consistent with this interpretation. There is also strong warming in the Arctic in winter, in

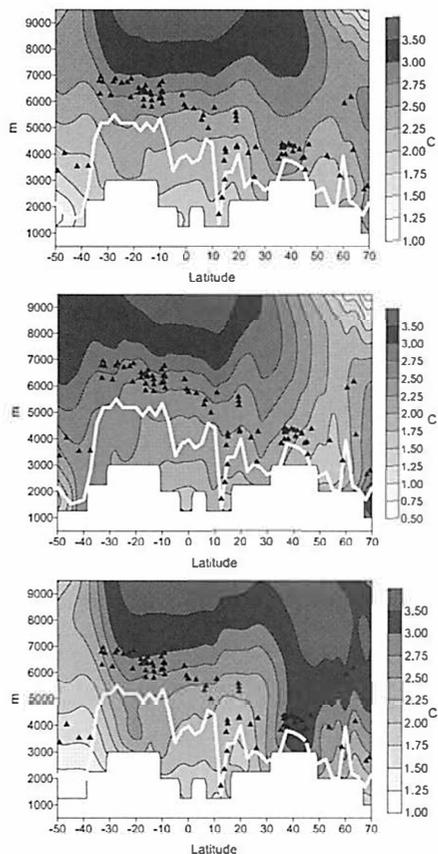
the lower troposphere, possibly related to a breakdown of near-surface temperature inversions, which would lead to mixing with relatively warm air above the surface boundary layer [cf. Bradley *et al.*, 1992]. We assessed the statistical significance of the changes by conducting a t-test at each grid point in each model. For both annual and boreal summer, the projected changes are statistically significant at the 0.01 level, in all models. In boreal winter, points poleward of ~50N, from the surface to the highest elevations examined, were not as significant in ~50% of the models. This is related to the higher variance in winter at these latitudes, and the smaller projected temperature changes, particularly at the highest elevations (middle panel, Figure 2).

[9] Of particular interest are those areas where the highest mountain regions intersect those regions where large temperature changes are simulated. In the southern hemisphere, temperature increases of >2.5°C are projected for the mountain zone from ~10°S (in Peru) through Bolivia to ~40°S (in Chile/Argentina). Many towns and large cities (such as La Paz and Lima) rely on runoff from glaciers in nearby high mountains for both water supplies and hydroelectric power. Meteorological data from these mountain regions are sparse, but indicate strong warming trends [Vuille *et al.*, 2003]. Moreover, glaciological



**Figure 1.** The transect of grid boxes along the North America/South America cordillera. Using the ETOPO5 five minute gridded earth topography data (available from NOAA's National Geophysical Data Center) mean elevations were calculated for grid boxes in an area encompassing the Cordillera. Then, for each row of grid boxes, the grid box with maximum mean elevation was chosen.

<sup>1</sup>Auxiliary material is available at <ftp://ftp.agu.org/apend/gl/2004GL020229>.



**Figure 2.** Mean change in temperature ( $2\times \text{CO}_2$  minus control runs) for the 7 models listed in Table 1. Data are displayed only for those latitudes and levels where data are available from all seven models. The solid white line connects elevations of the highest regions in each grid box; those elevations are the maximum of all the  $5' \times 5'$  ETOPO5 elevations in the grid box. The black triangles show some of the highest mountain peaks in each country along the transect. The white line crosses the missing data region in a few places due to some rounding in interpolation by the imaging software and to the topography files used by the models, which use sigma (or hybrid sigma) levels. *Upper panel:* mean annual temperature change; *Middle panel:* Dec–Feb mean temperature change; *Lower panel:* June–Aug mean temperature change.

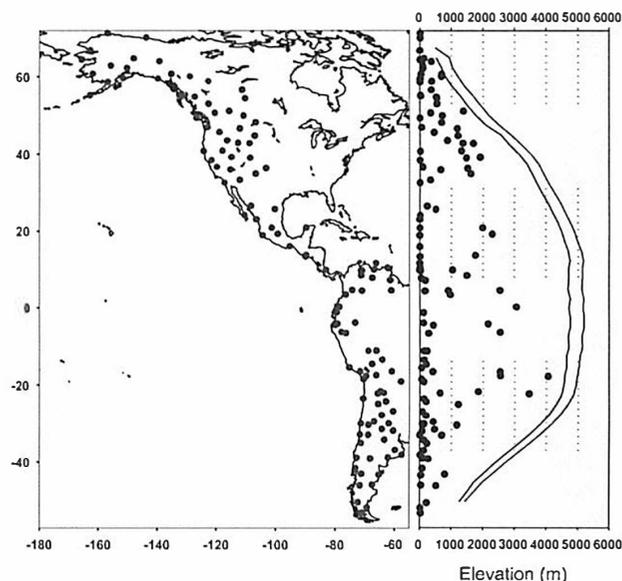
evidence is unequivocal in indicating that dramatic glacier retreat is underway already [Thompson *et al.*, 1993; Brecher and Thompson, 1993]. Ice core evidence from some locations also show that the heaviest oxygen isotope values of the last millennium were in recent decades, which has been interpreted as indicating the unusual nature of recent warming [Thompson *et al.*, 2003].

[10] Changes in temperature of the magnitude indicated in Figure 2 would likely result in the complete disappearance of glaciers from many regions due to an increase in the height of the equilibrium line altitude as freezing levels in the atmosphere rise in elevation [Diaz and Graham, 1996; Diaz *et al.*, 2003]. In the tropics, this may affect the lower margins of some glaciers, but a possible scenario is that increased humidity will reduce the vapor pressure gradient

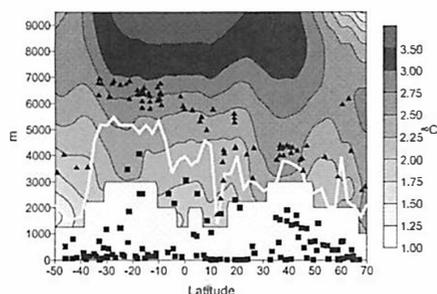
over the ice, leading to reduced sublimation and more melting (i.e., less energy being used in latent heat flux and more in sensible heat transfer). This would effectively lead to an increase in ice melting where solar radiation receipts are high (as in the inter-tropical zone) even in zones which remain below freezing [cf. Wagnon *et al.*, 1999]. Although the mechanisms may vary latitudinally, the overall effect will be for glaciers and ice caps to lose mass, with associated consequences for long-term water resources and hydropower production. Ecosystems downslope will also be affected, with the largest changes taking place in the alpine tundra and treeline zones. This could lead to treeline migration upslope in some areas, with associated reduction in the area of tundra ecosystems, though the exact response will also depend on precipitation changes. In those areas where temperatures rise and precipitation declines, ecosystem responses may be complex. In sub-tropical zones where mountains are forested to the summits, temperature changes may eliminate some ecosystems as they are forced to higher elevations that are more restricted in area [Still *et al.*, 1999]. Plant and animal populations may also become isolated in separate zones along particular mountain ranges. Such changes have important implications for planning of national parks and biosphere reserves that are designed for species conservation.

#### 4. Implications for GCOS

[11] The Global Climate Observing System (GCOS) of the World Meteorological Organisation includes a plan for long-term surface measurements at rural locations where very high



**Figure 3.** Distribution of planned GCOS surface station network in the western Americas and (on the right, black dots) the elevations of those stations with respect to latitude. Only 3 stations are planned for sites above 3000 m. Thus, the network fails to monitor those regions that model simulations indicate will have the greatest changes in temperature. Mean annual freezing level heights for control runs and  $2\times \text{CO}_2$  simulations are shown at right, in relation to the planned GCOS network.



**Figure 4.** Mean annual change in temperature ( $2\times\text{CO}_2$  minus control runs) for the 7 models listed in Table 1 compared to the planned GCOS surface network (squares) shown in Figure 3. More stations at higher elevations are needed to properly assess the model projections and monitor the large changes that the models indicate will affect high montane regions. The small black triangles represent the highest elevation mountains in countries along the transect.

quality observations will be maintained indefinitely into the future [Karl *et al.*, 1995]. The goal is to establish for posterity a global climate monitoring network that will provide unequivocal data to assess climate changes. Figure 3 shows the planned GCOS network for the western part of the Americas with the distribution of those stations by latitude and elevation. Also shown are the mean annual freezing level heights averaged for the 7 model control and  $2\times\text{CO}_2$  simulations. All GCOS stations are well below the freezing levels and only 3 stations are currently planned for elevations above 3000 m in the entire transect. Given that the model simulations indicate the largest changes in the future will be at high elevations, the GCOS network will not adequately sample the higher elevation zones of the American Cordillera where the impact of changes in climate may be greatest (Figure 4). The GCOS network should include a subset of stations at high elevation sites along the mountain chain, from southern Chile to Alaska [Bradley and Hardy, 2003]. Such a network will contribute to climate change detection and attribution, and to model verification studies. Furthermore, because the projected changes will inevitably affect the lower altitude range of the present snow zone, there is also a need for a range of stations, from altitudes at the current snow zone upwards through the altitude of projected (future) freezing levels. These could be established along selected transects across the main axis of the Cordillera. It is feasible to establish such a network, taking advantage of (for example) high elevation astronomical observatories, ski areas and mountain passes to facilitate access to the stations and instrument maintenance, without compromising station quality. Without such revisions to the current GCOS plan, areas that will be significantly affected by temperature change (and where changes already appear to be large) will not be adequately observed.

[12] These results are based on large-scale GCMs that provide a broad view of projected temperature changes in the future. They point to very significant changes that are consistent across many models. However, detailed regional climate modeling should be undertaken to refine this assessment of potential anthropogenic climate changes at the local level in areas with mountainous topography.

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# Ground warming patterns in the Northern Hemisphere during the last five centuries

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## Abstract

Changes in the Earth's surface energy balance recorded underground were used to reconstruct the temperature of the ground surface for the last 500 years in the Northern Hemisphere. We reconstructed ground surface temperature histories (GSTHs) from temperature versus depth profiles measured at 558 sites distributed between 30° and 60°N in the Northern Hemisphere. We show that the ground has warmed about 0.5 K in the last 100 years. Spatial analysis reveals that spatial variability is important and that the weighted average Northern Hemisphere GSTH shows some consistency with multiproxy and meteorological records reconstructions for the last two centuries.

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*Keywords:* ground temperature; borehole temperatures; ground warming; inversion

## 1. Introduction

There has been considerable work in borehole climatology in recent times [1–10]. However, the inference of spatial surface energy variations, from these data, has until recently remained unexplored, and spatial analysis using borehole temperature data exist only for Canada [11,12]. In this note, we report on the spatial analysis carried out for data from the Interna-

tional Heat Flow Commission data set, for a mid-latitude sector of the Northern Hemisphere (30–60°N). The data set used in this work contains 105 additional temperature logs that the data set used in [6]. We use a singular value decomposition (SVD) inversion, because the flexibility of this method allows for the separation of the climatic signal into principal components and subsequent reconstructions can be optimized for stability and resolution [13]. Furthermore, SVD selects the components of the ground surface temperature history (GSTH) best represented in the underground signal. This method provides also a safeguard avoiding overparameterization of the GSTH from the inversion [14,15]. We find a consistent increase of the

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ground surface temperature (GST) over most of the Northern Hemisphere for the period from 1930 to 1980, although the magnitude of the ground energy gained is not spatially homogeneous.

## 2. Theory

Let us consider the Earth's crust in thermal equilibrium. A temperature–depth profile starts at the surface at the mean-annual ground temperature and increases steadily with depth. If the temperature at the upper boundary of the body is increased, additional heat propagates into the body causing a corresponding increase in temperature just below the surface. The depth to which equilibrium temperatures are perturbed in a given time is governed by the thermal diffusivity of the body. For typical rocks, a thermal front (i.e., 5% change) propagates to about 20 m in 1 year, 50 m in 10 years, 160 m in 100 years, and 500 m in 1000 years. Thus, the Earth's ground temperature history over the last millennium is captured in the uppermost kilometer of the crust. The depth of a temperature perturbation is also related to the timing of surface changes. The shape of the perturbation reveals the details of the surface temperature history. Positive and negative subsurface temperature anomalies are associated with ground surface warming and cooling respectively. Thus, the temperature at depth  $z$ ,  $T(z)$ , is the superposition of the quasi-equilibrium temperature and of the temperature perturbation,  $T_r(z)$ , caused by ground surface temperature variations [16]:

$$T(z) = T_0 + q_0 R(z) + T_r(z) \quad (1)$$

where  $T_0$  is a reference ground temperature,  $q_0$  is the surface heat flow density,  $R(z)$  is the thermal depth.

If the past variations of ground surface temperature are modelled as a series of  $K$ -step temperature changes, then the subsurface temperature signals from each step change are superimposed, and the temperature perturbation at depth  $z$  is given by [14]:

$$T_r(z) = \sum_{k=1}^K T_k \left[ \operatorname{erfc} \left( \frac{z}{2\sqrt{\kappa t_k}} \right) - \operatorname{erfc} \left( \frac{z}{2\sqrt{\kappa t_{k-1}}} \right) \right] \quad (2)$$

where  $T_k$  are the ground surface temperatures, each value being an average over a period of time  $(t_k - t_{k-1})$ ,  $\operatorname{erfc}$  is the complementary error function and  $T_k$  are the times of the ground surface temperature changes.

The inverse problem consists in determination of  $T_0$ ,  $q_0$  and of the ground surface temperature history (GSTH) from  $T(z)$ . However,  $T_0$  and  $q_0$  could be independently estimated from the upward continuation from the deepest part of the profile, least affected by recent ground surface temperature changes. Eq. (1) is evaluated at every depth where data exist, forming a system of linear equations with  $k+2$  unknowns which can be inverted to obtain a series of ground surface temperature values, representing the GSTH at the site.

The system of linear equations can be written as:

$$\Theta_j = \mathbf{A}_{ji} \mathbf{X}_i, \quad (3)$$

where  $\Theta_j$  is a column vector containing the  $j$ -values of temperature measured at depth  $z_j$ ,  $\mathbf{X}_i$  is a column vector containing the model parameters,  $i+2$  unknowns ( $T_0$ ,  $q_0$ ,  $T_1, \dots, T_k$ );  $\mathbf{A}_{ji}$  is a  $(j \times i)$  matrix which contains 1 in the first column, the thermal resistance to depth  $z_j$ ,  $R(z_j)$ , in the second column, and the differences between complementary error functions at times  $t_{k-1}$  and  $T_k$  for depth  $z_j$  in columns 3 to  $k+2$ .

$$\begin{pmatrix} T_1 \\ T_2 \\ \vdots \\ T_j \\ T_k \end{pmatrix} = \begin{pmatrix} 1 & R_1 & A_{1,3} & A_{1,4} & \cdots & A_{1,k+2} \\ 1 & R_2 & A_{2,3} & A_{2,4} & \cdots & A_{2,k+2} \\ \vdots & \vdots & \vdots & \vdots & \ddots & \vdots \\ 1 & R_j & A_{j,3} & A_{j,4} & \cdots & A_{j,k+2} \end{pmatrix} \begin{pmatrix} T_0 \\ q_0 \\ T_1 \\ \vdots \\ T_k \end{pmatrix}; \quad (4)$$

$$A_{j,k+2} = \operatorname{erfc} \left( \frac{z_j}{2\sqrt{\kappa t_k}} \right) - \operatorname{erfc} \left( \frac{z_j}{2\sqrt{\kappa t_{k-1}}} \right). \quad (5)$$

The system of linear Eq. (4) can be solved using singular value decomposition (SVD) [17,18,19]. Any matrix  $\mathbf{A}(j \times i)$  can be decomposed as  $\mathbf{A} = \mathbf{U} \mathbf{\Lambda} \mathbf{V}^T$ , where  $\mathbf{\Lambda}$  is a  $j \times i$  diagonal matrix which contains on the diagonal entries the non-zero singular values  $\lambda_{(r)}$  of matrix  $\mathbf{A}$ ,  $r=1, \dots, R$ ,  $R$  is the rank of  $\mathbf{A}$ ;  $\lambda_{(r)}$  are obtained by square roots of the eigenvalues of the symmetric matrix  $\mathbf{A}^T \mathbf{A}$ ;  $\mathbf{U}$  is a  $j \times j$  column orthogonal matrix, each column forming a vector, and all  $j$

normed vectors ( $u_j$ ) forming a basis into the data space;  $V$  is an  $i \times i$  orthogonal matrix, each column forming a vector, and all  $i$  normed vectors ( $v_i$ ) forming a basis into the model space. The vectors  $v_i$  are also eigenvectors corresponding to the eigenvalues of  $A^T A$ . The eigenvectors that span the model space,  $v_i$ , could be interpreted as the effect on the subsurface of a GSTH given by the eigenvectors that span the data space,  $u_j$  [20].

A general solution is given by [17]:

$$X = V \Lambda^{-1} U^T \Theta. \quad (6)$$

Determination of model parameters requires dividing the data by the singular values. Any error in the data will be amplified for the very small singular values. In order to reduce the impact of noise, the singular values which are smaller than a cutoff value are eliminated [21]. Although this is no longer the true solution, SVD selects the linear combination of model parameters that is best constrained by the data. The largest contribution to the standard error in the estimated model parameters is that of the principal component in  $V$  associated with the smallest retained eigenvalue. The variance of the estimated model parameters can be written as [18]

$$\sigma_m^2 = \sum_{r=1}^R \frac{V_{rm}^2}{\lambda_r^2}. \quad (7)$$

The variance represents the amplification of the measurement errors in the solution (that is, it is the standard error on the estimated parameter corresponding to a 1 K standard deviation in the temperature measurements). As a result of the smoothing performed to allow a proper spatial analysis, the noisiest temperature log included in the analysis is the one determining the resolution retrieved from the data [22]. Individual temperature–depth profile inversion yields results with much more detail. The magnitude of the noise in each borehole temperature profile is the limit of the resolution for a given GSTH. However, since each temperature log was measured by different research teams at different times, each temperature depth profile has a different noise level due to instrumentation sensitivity, stratigraphic noise due to variations of the thermal properties of the underlying rocks. Low noise levels may allow for additional principal components to be

included in the analysis and thus improving the resolution. Higher noise restricts the number of retained principal components and thus reduces the resolution of the retrieved climatic signal. Since this different filtering yields GSTH with different resolutions, it is not possible to individually invert each temperature–depth profile to achieve maximum individual resolution and then attempt to infer common large scale ground temperature changes.

The solutions obtained by retaining only a few singular values, and thus few principal components, can reproduce the gross features of a GSTH [19] and are stable against the presence of data noise. Over-parameterizations, that is, attempts to resolve model parameters of short duration ( $\leq 20$  years), yield unstable solutions without physical meaning. Details of the SVD inversion and its robustness can be found in Refs. [13,14].

### 3. Analysis

#### 3.1. Inversion

The model for each individual SVD inversion consists of a series of equal duration steps. Fifty-year model step changes in ground surface temperature were used for the last 500 years. The value of the thermal diffusivity was set at  $10^{-6} \text{ m}^2 \text{ s}^{-1}$  [8,23]. The eigenvalue cutoff was set at 0.3 for each GSTH inversion, keeping five principal components for all of the temperature–depth profiles included in the reconstruction. This is a fundamental point as spatial analysis performed from inversions at different resolution or jointly analyzing temperature–depth profiles of different depths are uncertain [11]. Each SVD inversion extracts from the data the long-term surface temperature, semiequilibrium steady state geothermal heat flow density, and the recent climate induced surface temperature changes. These GST changes are expressed throughout this paper as departures from the long-term mean at each location before 1500. Our geothermal based reconstructions of past surface temperatures assume that there is no significant climate variation in scales longer than 500 years. This is a consequence of the decrease in signal and resolution of distant past climatic events [22], and also of the filtering,

arising from the retention of few principal components, required to stabilize the solution obtained from data with different noise levels [13]. The effects of long period events in the distant past, such as the Pleistocene glaciation, are most important at depth of more than 1 km and in our case, these effects are removed with the steady state geothermal gradient correction.

Fig. 1 displays the distribution of the sites and the maximum depth of the borehole temperature logs analyzed in this study. Because data were acquired in holes of opportunity, the spatial distribution of the sites is uneven. Additionally, temperature logs were taken at different times thus it is necessary to incorporate measurement time difference in the inversion. The analysis here represents the temperature recorded up to 1999, although we have restricted our analysis to 1980. Shallow borehole ( $\approx 200$ – $250$  m) distribution, and thus a small time window into the past, are well compensated by deep boreholes in all areas.

### 3.2. Gridding and hemispheric average

In order to avoid giving too much representation to areas in the Northern Hemisphere containing large number of boreholes (Canada, for example), we used a gridding procedure for display purposes. We first filter the data on a  $5^\circ \times 5^\circ$  cell grid. A block average method has been applied to compute a mean location and the L2 norm average  $\Delta t$  value in each cell. This is to suppress redundant data and avoid spatial aliasing. Then a surface gridding algorithm produces a  $15'$  gridded data set [24]. This algorithm generates

gridded values  $z(x,y)$  from unevenly spaced data  $(x,y,z)$  by solving the following equation:

$$\left[ (1 - \lambda)(\nabla^2)^2 - \lambda(\nabla^2) \right] z(x,y) = 0, \quad (8)$$

where  $\lambda$  is a tension parameter ranging from 0 to 1, and  $\nabla^2$  denotes the Laplacian operator:  $\nabla^2 = \partial^2 / \partial x^2 + \partial^2 / \partial y^2$ .  $\lambda=0$  leads to the biharmonic differential equation and corresponds to the minimum curvature solution that can have unwanted oscillations and false local extrema.  $\lambda=1$  corresponds to an infinite tension, it gives a harmonic solution that cannot have local minima and maxima in the free region. The tension parameter we used ( $\lambda=0.25$ ) yields a near minimal curvature surface. We let edges at  $20^\circ\text{S}$  and  $70^\circ\text{N}$  of latitude be free. The grid is periodic in  $360^\circ$  of longitude. To account for the shrinking size of the geographical cells towards the poles, the gridding procedure was done on a kilometeric grid then transferred to a geographical grid using a sinusoidal projection. This area-preserving projection is given by the transformation

$$\begin{cases} x = (\lambda - \lambda_0)\cos\theta \\ y = \theta \end{cases} \quad (9)$$

where  $\lambda_0$  is the central meridian,  $(\lambda, \theta)$  are the longitudinal and latitudinal coordinates, and  $(x,y)$  the kilometeric coordinates. When mapping the final grid, we draw only the  $5^\circ$  cells which contain at least one borehole and we mask all the oceanic areas. A continuous and equidistant color table was used. We extract the data between  $30^\circ\text{N}$  and  $60^\circ\text{N}$  at the very end of the processing to avoid edge effects.

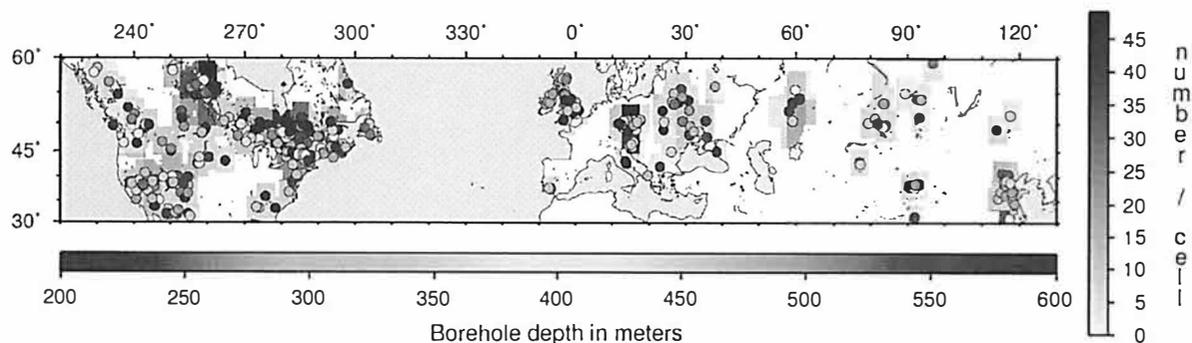


Fig. 1. Borehole density (number of temperature depth profiles per grid cell), site location, and depth of the borehole temperature logs used in this analysis. Sites are unevenly distributed because measurements are conducted in holes of opportunity.

Because of the sparse spatial distribution of the boreholes, we used an averaging technique to compute the ground surface temperature history rather than a simple arithmetic average. The arithmetic average gives excessive weight to areas of high borehole density. In order to determine hemispheric average, different schemes have already been proposed. Mann et al. [25] argued for an area-weighted average. Pollack and Smerdon [26] have examined this method and another weighting scheme based on grid-cell occupancy. In this paper, we reassess the continental Northern Hemisphere average using a kilometeric gridding instead of geographic aggregation. Thus, cells are of the same size and no area weighting is required. Borehole locations were first converted into kilometer units using a sinusoidal projection relative to (0°N, 0°W). Temperature data were averaged on 500×500 km cells to avoid spatial aliasing and suppress redundancy. We did the same for 1000×1000 km cells. These sizes were chosen after several trials to avoid getting too many cells filled with a single borehole, and to have a density as uniform as possible. Grid size effects, however, are not important on the determination of the Northern Hemisphere average [26]. For the 500×500 km case, a total of 154 cells were filled over the world grid. The

occupancy level was at least one borehole, up to 48 with an average of five per grid cell. For the 1000×1000 km case, a total of 84 cells were filled over the world grid. The occupancy level was at least one borehole, up to 29 with an average of seven per grid cell. To avoid that some latitudes (e.g., Canadian latitudes) containing many filled cells distort the hemispheric representation, we give the same weight to all latitudes by filling the empty cells with the average temperature value of their respective latitude. Latitudinal area-weighted average based on 5°×5° and 10°×10° grid cells and a simple arithmetic average was also calculated for comparison purposes.

#### 4. Results and discussion

The resulting averages GSTH from 558 Northern Hemisphere temperature profiles are shown in Fig. 2. The latitudinal area-weighted averages are not significantly different and fall inside the error bar of the latitudinal kilometeric averages whatever the cell size considered. The arithmetic average is also shown in Fig. 2 to facilitate comparison with previous works. Our arithmetic average compares well with previous arithmetic average analysis of borehole global data

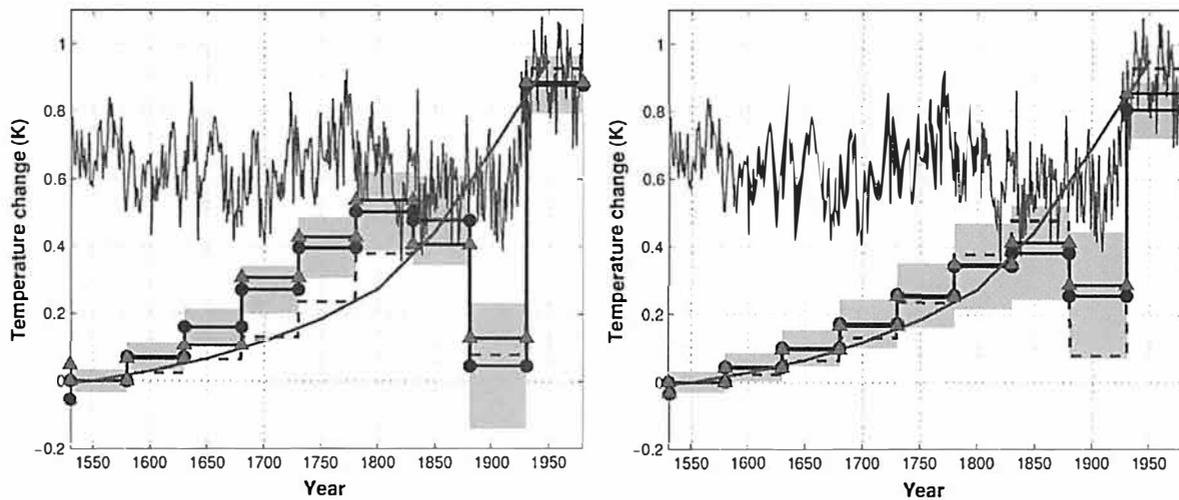


Fig. 2. Average ground surface temperature history for the Northern Hemisphere between 30°N and 60°N from the inversion of 558 temperature depth profiles. Left panel: Circles represent the latitudinal average based on 500×500 km cell grid. The shaded area represents the stability of the GSTH to the presence of noise in the temperature measurements for this cell size. Triangles represent the latitudinal average based on 5°×5° cell grid. The solid continuous line is Huang et al.'s [6] arithmetic average and the dashed line represents our arithmetic average. Mann et al.'s [37] multiproxy SAT reconstruction are represented by the gray highly variable line. Right panel: Same results but with 1000×1000 km cell gridding (•) and 10°×10° cell grid (△). These different GSTH are presented here to facilitate comparisons. The temperature changes are expressed as departures from the long-term mean (steady-state temperature) at each of the sites analyzed.

[6,8], except for the 50-year colder period from 1880 to 1930 apparent in our results. The average Northern Hemisphere GSTH shows a marked increase in the energy stored in the shallow subsurface since about 1900, consistent with the expectations due to increased levels of greenhouse gases since the onset of the industrial revolution [27]. Average ground temperature increase is about 0.5 K during this period.

Spatial variations of the ground surface temperature are well documented so far only for Canada [12]. Here we examined the spatial distribution of changes in ground surface temperature for the complete continental Northern Hemisphere. Fig. 3 shows the ground temperature changes since 1680 in this area. Clearly, there is a significant ground temperature changes in the recent past. The collection of panels in Fig. 3 shows the series of the spatial distribution of ground temperature variations for several 50-year periods during the last 300 years. The spatial distribution of the recent climatic warming, which appears to be wide spread in some regions shown in Fig. 3, implies that Northern Hemisphere averages must be considered with caution.

It is important to realize that because of heat diffusion, the resolution of borehole temperature data decreases with time [22], such that under the restrictions needed for obtaining robust Northern Hemisphere spatial average, the global inversion cannot retrieve significant information at times before 1500. It is possible to retrieve additional paleoclimatic information from individual borehole inversions. However, since each temperature log has different noise levels, it is often the case that each inversion is performed with a different number of principal components and thus it is extremely difficult to arrive at a common denominator, or GSTHs of equal resolution, to allow for a proper interpretation to obtain an homogeneous global result.

The ground surface temperature since 1500 appears to have been significantly lower than at present. This period includes part of the Little Ice Age cold period reported in some areas of Europe and North America [28,29]. This cold period has been previously detected from individual borehole data inversions in areas of Canada [1,3,12–15,30]. According to Fig. 3, the progression of the warming appears to be South to North, and larger in magnitude in North America than in Eastern Europe. We see no signs of

predominant warming toward the high latitudes, although a more complete analysis incorporating some of the data in the Canadian Arctic is underway, and may provide additional information.

Areas in Central Canada show temporal variations consistent with previous analysis for data in this area [1,4,15]. Labrador and Newfoundland show very little changes with respect to the long-term mean. This is consistent with at least the last 100 years of Environment Canada meteorological data collected in this area of Canada [31], which show a null trend for Newfoundland. Regions in the Mid-West USA (Utah, for example) show little warming in recent years in agreement with meteorological data, and with borehole temperature data from an independent data set not included in our analysis [10].

Cooling is also observed during the 1880–1930 period in regions of North America and Central Europe. This cooling event is however, not synchronous; depending on the averaging method this cooling maybe visible or masked. This period's cooling is reflected in the Northern Hemisphere mean GSTH (Fig. 2) as a decrease in ground surface temperature of about 0.2–0.4 K depending on the averaging technique. This is in agreement with local meteorological records in Romania and Slovenia, and from previous GSTH reconstructions for these areas [32–35]. There is a recovery from these cold anomalies in the second half of the 20th century, with the last 50 years exhibiting an extraordinary energy gain by the ground in agreement with previous studies of heat gain by oceans, atmosphere, cryosphere and continental areas for this time period [7,8,36].

It is not possible to directly compare these results to the analysis carried out by Mann et al. [25,37] for a number of reasons. Mann et al.'s [25] results have been shown to contain errors in the analysis [26] for which a correction has recently appeared in the literature [38]. Furthermore, the analysis performed by Mann et al. [25], compared SAT records at grid sizes too small ( $5^{\circ} \times 5^{\circ}$ ) to be meaningful because of the sparse population of borehole records [26]. We have included the  $5^{\circ} \times 5^{\circ}$  Northern Hemisphere average results only to facilitate comparison. Larger grids ( $10^{\circ} \times 10^{\circ}$ ) are needed to increase confidence in the average (see Fig. 2).

A factor that might help explain the disagreement of the multiproxy reconstruction and borehole-based

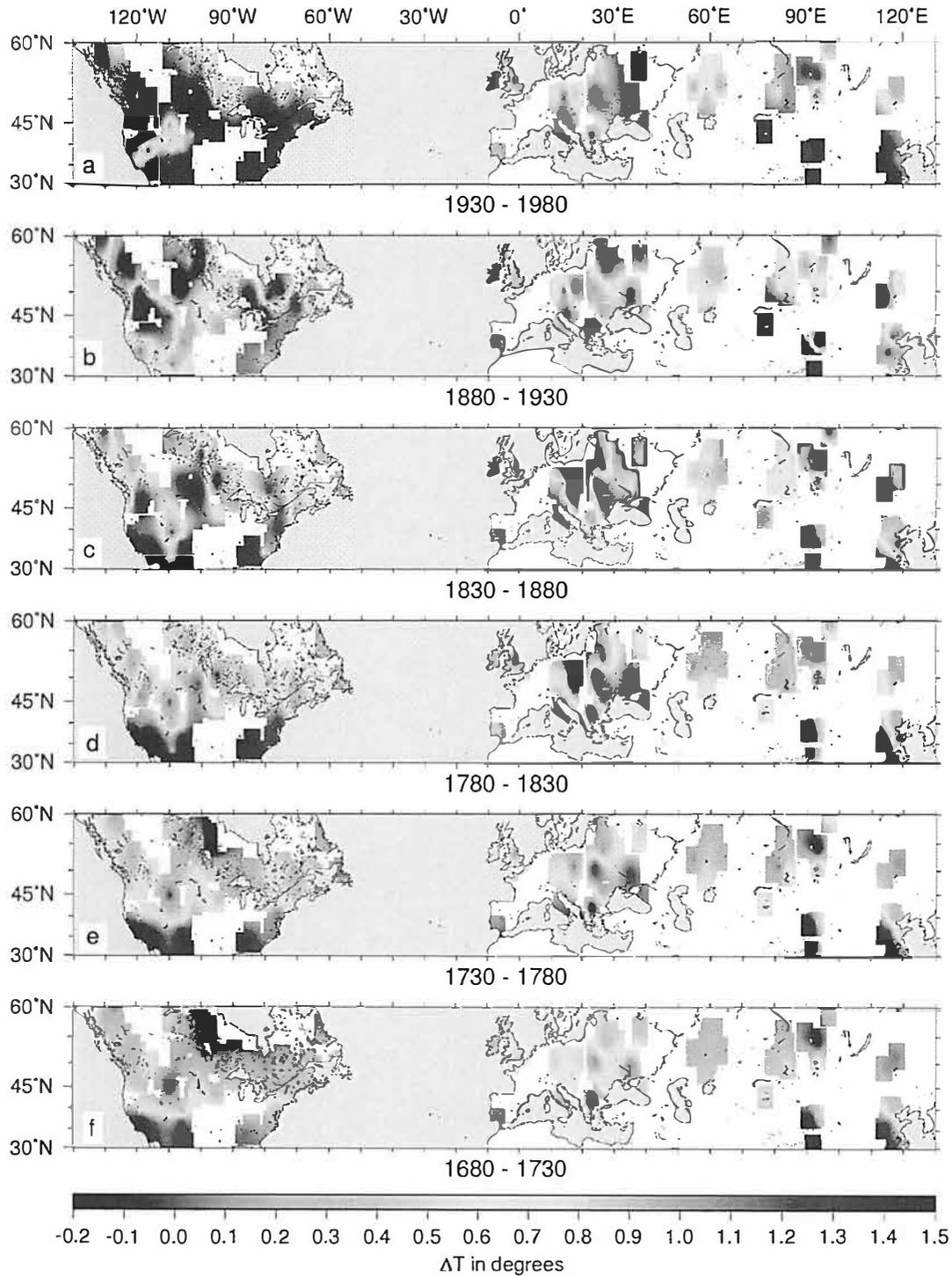


Fig. 3. (a–f) Spatial distribution of the ground surface temperature history for the period between 1680 and 1980. The GSTH are expressed as departures from the long-term mean before 1500 at each location. The results are presented for 50-year time intervals. This figure was constructed from the results of the inversion of 558 temperature depth profiles in the Northern Hemisphere between 30°N and 60°N. All inversions included in the analysis were performed with the same eigenvalue cutoff. The same number of principal components was included in the reconstruction of each GSTH. This is required for performing a spatial analysis at the same resolution to allow for proper comparison.

reconstruction rests in the different sensitivity of these records. The multiproxy reconstruction [37] is strongly based on dendrochronological data which are known not to preserve the long-term trends [39]. This is because each single tree ring series is fitted with a different and arbitrary “growth trend removal” function. Removal of the growth trend filters out long-term variations and removes climatic information from a different frequency band for each tree-ring series before individual series are combined into a site chronology. A recent work [40] has found that long-term trend removal from tree-ring series does in fact explain the discrepancies between geothermal and multiproxy reconstruction. Furthermore, tree-growth records growth season temperature and precipitation, and unlike geothermal data, trees do not integrate the energy balance at the Earth’s surface over the whole year. Ground temperature histories, on the other hand, are long-term indicators of the energy balance at the surface. Thus, the heat budget in the subsurface is a long-term response of the Earth to energy balance changes at its surface.

## 5. Conclusions

Even if some disagreements on climatic reconstructions from geothermal and multiproxy data exist, our results are encouraging. This study points out some consistency with multiproxy and meteorological records at least for the two last centuries in Central Europe, Mid-West North America, and Eastern Canada. We do not expect an agreement between multiproxy and geothermal data prior to 1800 due to the long-period signal removal during the analysis of dendrochronological data [40]. The cold excursion at the beginning of the last century, not observed in previous works (e.g., Huang et al.’s [6] arithmetic average), is recovered with all area-weighted averaging procedures we used. We observe warming of almost 1 °C for the last five centuries, half of this warming occurred during the last 50 years.

## Acknowledgments

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Subject: Fwd: hockey stick again...

From: "Michael E. Mann" <mann@virginia.edu>

Date: 2/19/05 12:44 PM

To: Stephen H Schneider <shs@stanford.edu>, Tom Wigley <wigley@ucar.edu>, Ben Santer <santer1@llnl.gov>, mann@virginia.edu, rbradley@geo.umass.edu, mhughes@ltrr.arizona.edu, omichael@Princeton.edu, jmahlman@ucar.edu

fyi, a response to the WSJ disinformation in easily digestible form...

Mike

- > The 'dummies guide' I mentioned to you yesterday is now
- > available at <http://www.realclimate.org/index.php?p=121>
- >
- > I attach a pdf version that might be easier to send around or print.

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Attachments:  
dummies.pdf 275 KB

# Dummies guide to the latest "Hockey Stick" controversy

by Gavin Schmidt and Caspar Amman: Online version

Due to popular demand, we have put together a 'dummies guide' which tries to describe what the actual issues are in the latest controversy, in language even our parents might understand. A pdf version is also available. More technical descriptions of the issues can be seen [here](#) and [here](#).

This guide is in two parts, the first deals with the background to the technical issues raised by McIntyre and McKittrick (2005) (MM05), while the second part discusses the application of this to the original Mann, Bradley and Hughes (1998) (MBH98) reconstruction. The wider climate science context is discussed [here](#), and the relationship to other recent reconstructions (the 'Hockey Team') can be seen [here](#).

NB. All the data that were used in MBH98 are freely available for download at <ftp://holocene.evsc.virginia.edu/pub/sdr/temp/nature/MANNETAL98/> (and in the supplementary data at *Nature*), along with thorough descriptions of the algorithms.

## Part I: Technical issues:

### 1) What is principal component analysis (PCA)?

This is a mathematical technique that is used (among other things) to summarize the data found in a large number of noisy records so that the essential aspects can more easily be seen. The most common patterns in the data are captured in a number of 'principal components' which describe some percentage of the variation in the original records. Usually only a limited number of components ('PC's) have any statistical significance, and these can be used instead of the larger data set to give basically the same description.

### 2) What do these individual components represent?

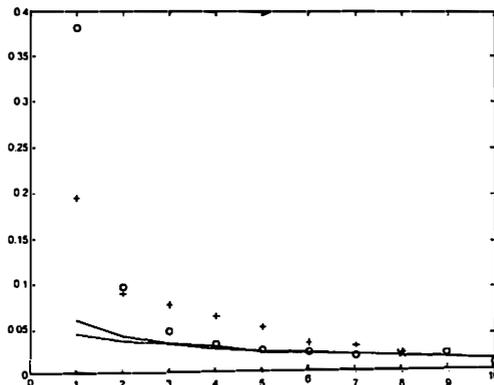
Often the first few components represent something recognisable and physical meaningful (at least in climate data applications). If a large part of the data set has a trend, then the mean trend may show up as one of the most important PCs. Similarly, if there is a seasonal cycle in the data, that will generally be represented by a PC. However, remember

that PCs are just mathematical constructs. By themselves they say nothing about the physics of the situation. Thus, in many circumstances, physically meaningful timeseries are 'distributed' over a number of PCs, each of which individually does not appear to mean much. Different methodologies or conventions can make a big difference in which pattern comes up tops. If the aim of the PCA analysis is to determine the most important pattern, then it is important to know how robust that pattern is to the methodology. However, if the idea is to more simply summarize the larger data set, the individual ordering of the PCs is less important, and it is more crucial to make sure that as many significant PCs are included as possible.

### 3) How do you know whether a PC has significant information?

This determination is usually based on a 'Monte Carlo' simulation (so-called because of the random nature of the calculations). For instance, if you take 1000 sets of random data (that have the same statistical properties as the data set in question), and you perform the PCA analysis 1000 times, there will be 1000 examples of the first PC. Each of these will explain a different amount of the variation (or variance) in the original data. When ranked in order of explained variance, the tenth one down then defines the 99% confidence level: i.e. if your real PC explains more of the variance than 99% of the random PCs, then you can say that this is significant at the 99% level. This can be done for each PC in turn. (This technique was introduced by Preisendorfer et al. (1981), and is called the Preisendorfer N-rule).

The figure to the right gives two examples of this. Here each PC is plotted against the amount of fractional variance it explains. The blue line is the result from the random data, while the blue dots are the PC results for the real data. It is clear that at least the first two are significantly separated from the random noise line. In the other case, there are 5 (maybe 6) red crosses that appear to be distinguishable from the red line random noise. Note also that the first ('most important') PC does not always explain the same amount of the original data.



#### **4) What do different conventions for PC analysis represent?**

Some different conventions exist regarding how the original data should be normalized. For instance, the data can be normalized to have an average of zero over the whole record, or over a selected sub-interval. The variance of the data is associated with departures from the whatever mean was selected. So the pattern of data that shows the biggest departure from the mean will dominate the calculated PCs. If there is an *a priori* reason to be interested in departures from a particular mean, then this is a way to make sure that those patterns move up in the PC ordering. Changing conventions means that the explained variance of each PC can be different, the ordering can be different, and the number of significant PCs can be different.

#### **5) How can you tell whether you have included enough PCs?**

This is rather easy to tell. If your answer depends on the number of PCs included, then you haven't included enough. Put another way, if the answer you get is the same as if you had used all the data without doing any PC analysis at all, then you are probably ok. However, the reason why the PC summaries are used in the first place in paleo-reconstructions is that using the full proxy set often runs into the danger of 'overfitting' during the calibration period (the time period when the proxy data are trained to match the instrumental record). This can lead to a decrease in predictive skill outside of that window, which is the actual target of the reconstruction. So in summary, PC selection is a trade off: on one hand, the goal is to capture as much variability of the data as represented by the different PCs as possible (particularly if the explained variance is small), while on the other hand, you don't want to include PCs that are not really contributing any more significant information.

## **Part II: Application to the MBH98 'Hockey Stick'**

### **1) Where is PCA used in the MBH methodology?**

When incorporating many tree ring networks into the multi-proxy framework, it is easier to use a few leading PCs rather than 70 or so individual tree ring chronologies from a particular region. The trees are often very closely located and so it makes sense to summarize the general information they all contain in relation to the large-scale patterns of variability. The relevant signal for the climate reconstruction is the signal that the trees have in common, not each individual series. In MBH98, the North American tree ring series

were treated like this. There are a number of other places in the overall methodology where some form of PCA was used, but they are not relevant to this particular controversy.

## 2) What is the point of contention in MM05?

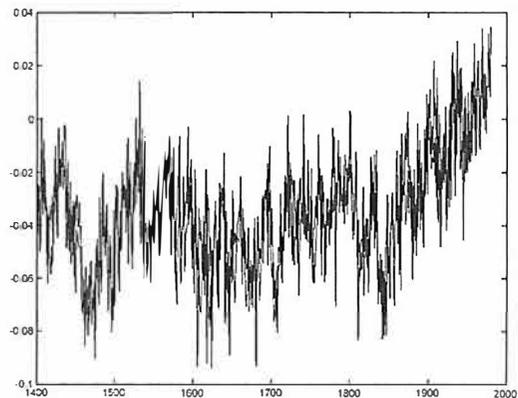
MM05 contend that the particular PC convention used in MBH98 in dealing with the N. American tree rings selects for the 'hockey stick' shape and that the final reconstruction result is simply an artifact of this convention.

## 3) What convention was used in MBH98?

MBH98 were particularly interested in whether the tree ring data showed significant differences from the 20th century calibration period, and therefore normalized the data so that the mean over this period was zero. As discussed above, this will emphasize records that have the biggest differences from that period (either positive or negative). Since the underlying data have a 'hockey stick'-like shape, it is therefore not surprising that the most important PC found using this convention resembles the 'hockey stick'. There are actually two significant PCs found using this convention, and both were incorporated into the full reconstruction.

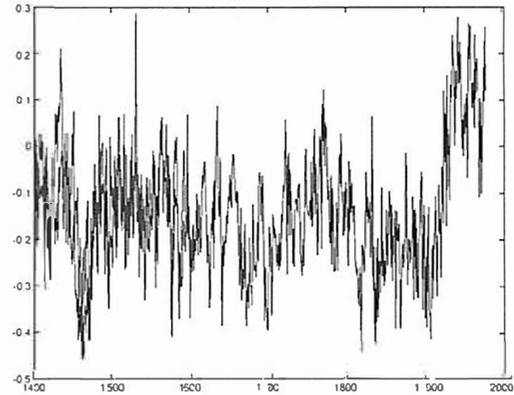
## 4) Does using a different convention change the answer?

As discussed above, a different convention (MM05 suggest one that has zero mean over the whole record) will change the ordering, significance and number of important PCs. In this case, the number of significant PCs increases to 5 (maybe 6) from 2 originally. This is the difference between the blue points (MBH98 convention) and the red crosses (MM05 convention) in the first figure. Also PC1 in the MBH98 convention moves down to PC4 in the MM05 convention. This is illustrated in the figure on the right, the red curve is the original PC1 and the blue curve is MM05 PC4 (adjusted to have same variance and mean).



But as we stated above, the underlying data has a hockey stick structure, and so in either case the 'hockey stick'-like PC explains a significant part of the variance. Therefore, using

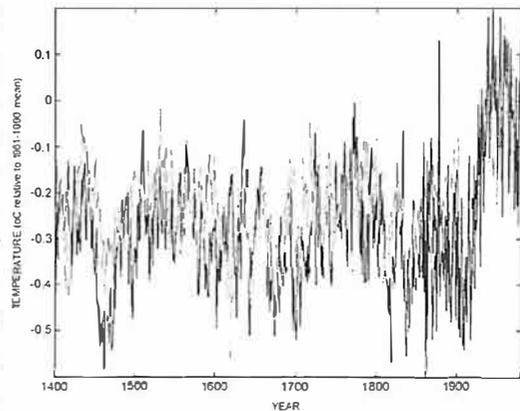
This figure shows the difference in the final result whether you use the original convention and 2 PCs (blue) and the MM05 convention with 5 PCs (red). The MM05-based reconstruction is slightly less skillful when judged over the 19th century validation period but is otherwise very similar. In fact any calibration convention will lead to approximately the same answer as long as the PC decomposition is done properly and one determines how many PCs are needed to retain the primary information in the original data.



the MM05 convention, more PCs need to be included to capture the significant information contained in the tree ring network.

### 5) What happens if you just use all the data and skip the whole PCA step?

This is a key point. If the PCs being used were inadequate in characterizing the underlying data, then the answer you get using all of the data will be significantly different. If, on the other hand, enough PCs were used, the answer should be essentially unchanged. This is shown in this figure. The reconstruction using all the data is in yellow (the green line is the same thing but with the 'St-Anne River' tree ring chronology taken out). The blue line is the original reconstruction, and as you can see the correspondence between them is high.

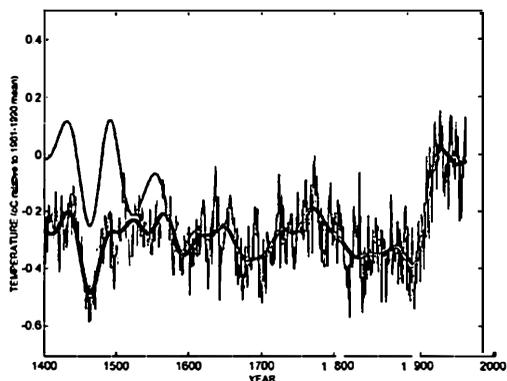


The validation is slightly worse, illustrating the trade-off mentioned above i.e. when using all of the data, over-fitting during the calibration period (due to the increase number of degrees of freedom) leads to a slight loss of predictability in the validation step.

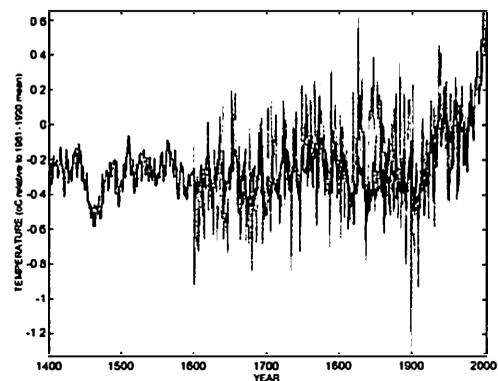
**6) So how do MM05 conclude that this small detail changes the answer?**

MM05 claim that the reconstruction using only the first 2 PCs with their convention is significantly different to MBH98. Since PC 3,4 and 5 (at least) are also significant they are leaving out good data. It is mathematically wrong to retain the same number of PCs if the convention of standardization is changed.

In this case, it causes a loss of information that is very easily demonstrated. Firstly, by showing that any such results do not resemble the results from using all data, and by checking the validation of the reconstruction for the 19th century. The MM version of the reconstruction can be matched by simply removing the N. American tree ring data along with the 'St Anne River' Northern treeline series from the reconstruction (shown in yellow). Compare this curve with the ones shown above.



As you might expect, throwing out data also worsens the validation statistics, as can be seen by eye when comparing the reconstructions over the 19th century validation interval. Compare the green line in the figure below to the instrumental data in red. To their credit, MM05 acknowledge that their alternate 15th century reconstruction has no skill.



**7) Basically then the MM05 criticism is simply about whether selected N. American tree rings should have been included, not that there was a mathematical flaw?**

Yes. Their argument since the beginning has essentially *not* been about methodological issues at all, but about 'source data' issues. Particular concerns with the "bristlecone pine"

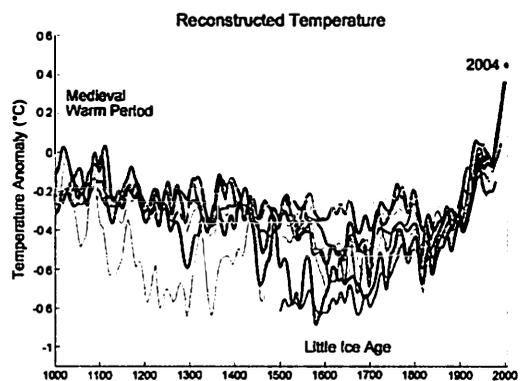
data were addressed in the followup paper MBH99 but the fact remains that including these data improves the statistical validation over the 19th Century period and they therefore should be included.

### 8) So does this all matter?

No. If you use the MM05 convention and include all the significant PCs, you get the same answer. If you don't use any PCA at all, you get the same answer. If you use a completely different methodology (i.e. Rutherford et al, 2005), you get basically the same answer. Only if you remove significant portions of the data do you get a different (and worse) answer.

### 9) Was MBH98 the final word on the climate of last millennium?

Not at all. There has been significant progress on many aspects of climate reconstructions since MBH98. Firstly, there are more and better quality proxy data available. There are new methodologies such as described in Rutherford et al (2005) or Moberg et al (2005) that address recognised problems with incomplete data series and the challenge of incorporating lower resolution data into the mix. Progress is likely to continue on all these fronts. As of now, all of the 'Hockey Team' reconstructions (shown left) agree that the late 20th century is anomalous in the context of last millennium, and possibly the last two millennia.



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