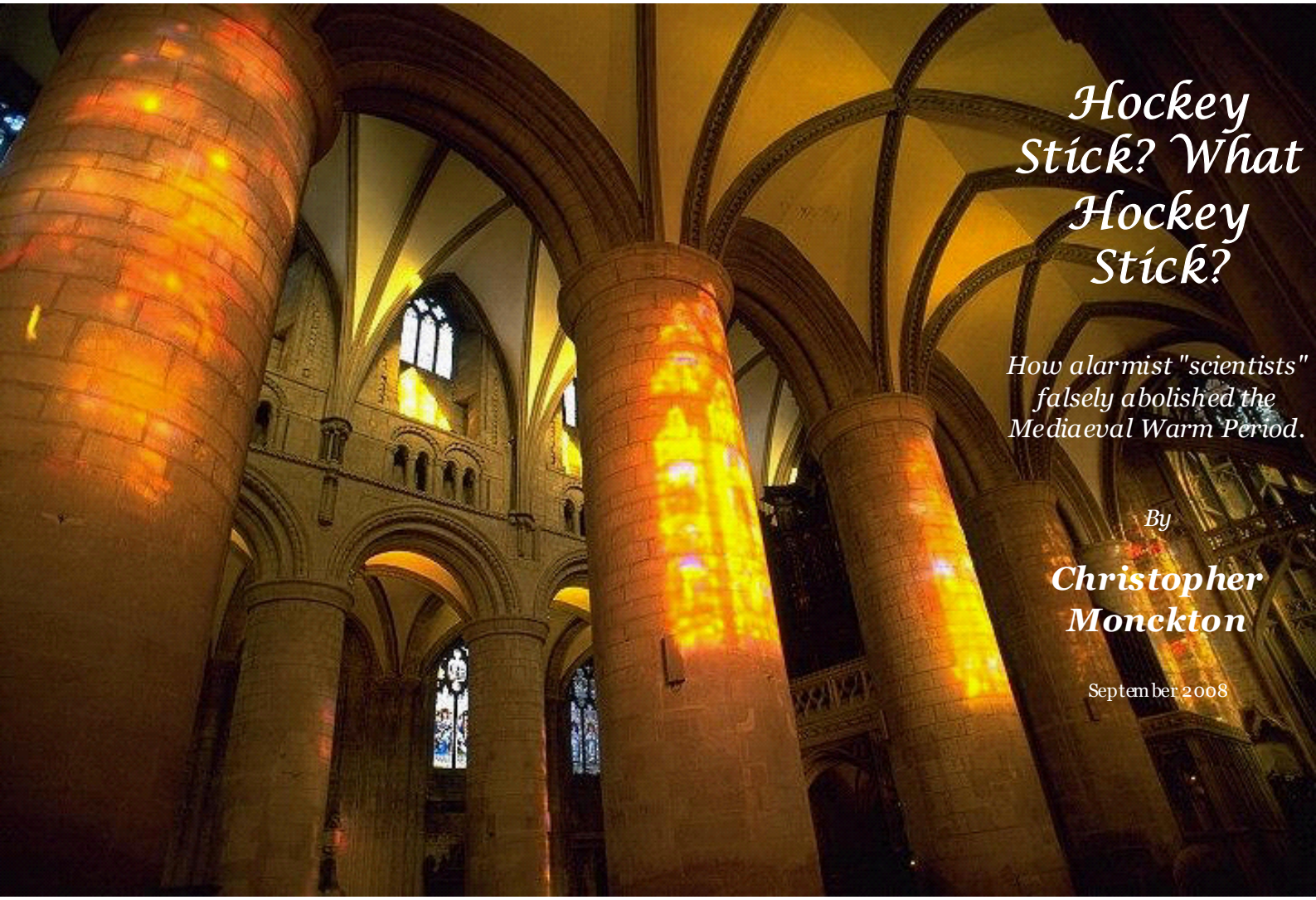


Hockey Stick? What Hockey Stick?

How alarmist "scientists" falsely abolished the Mediaeval Warm Period.

By

Christopher Monckton

September 2008

SPPI
Science & Public Policy Institute
"science based policy for a better world."

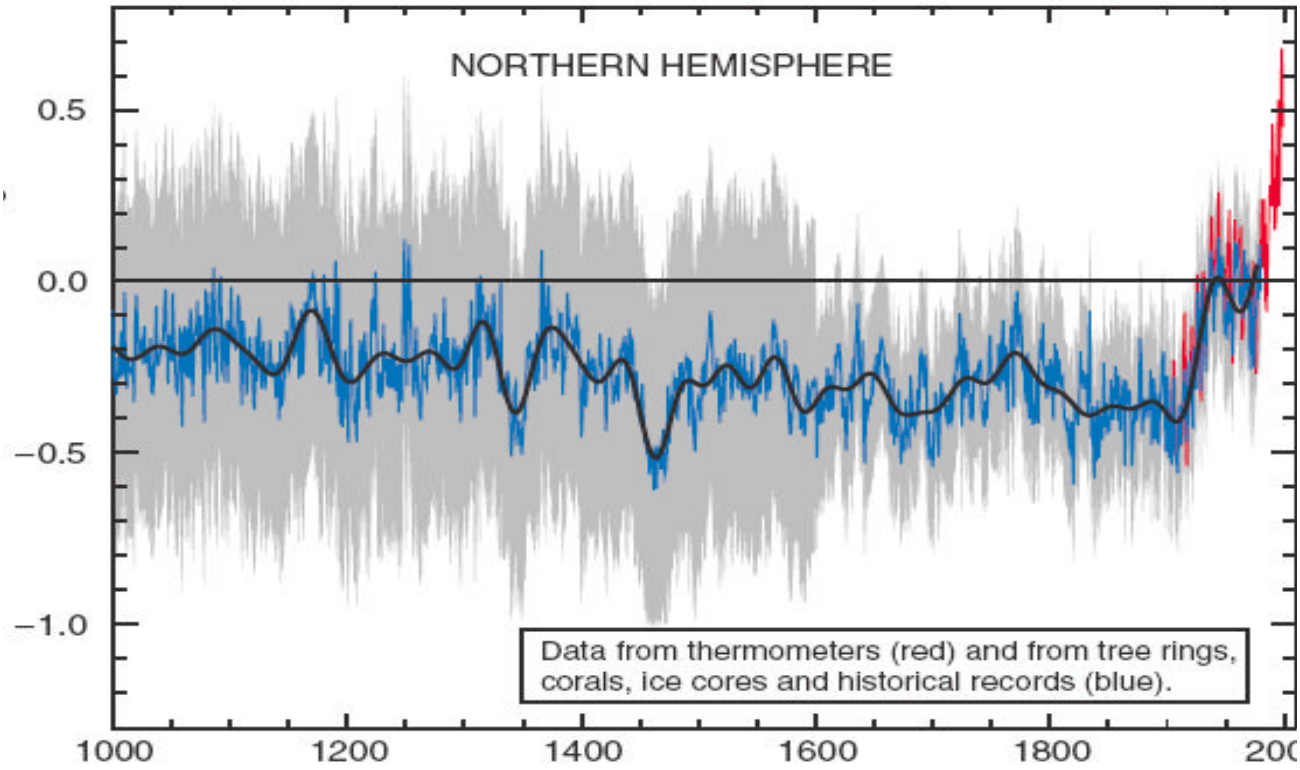
SPPI Commentary and Essay series

AN EXTRAORDINARY SERIES of postings at www.climateaudit.org, the deservedly well-trafficked website of the courageous and tenacious Canadian statistician Steve McIntyre, is a remarkable indictment of the corruption and cynicism that is rife among the alarmist climate scientists favored by the UN's discredited climate panel, the IPCC.

In laymen's language, the present paper respectfully summarizes Steve McIntyre's account of the systematically dishonest manner in which the "hockey-stick" graph falsely showing that today's temperatures are warmer than those that prevailed during the medieval climate optimum was fabricated in 1998/9, adopted as the poster-child of climate panic by the IPCC in its 2001 climate assessment, and then retained in its 2007 assessment report despite having been demolished in the scientific literature.

It is a long tale, but well worth following. No one who reads it will ever again trust the IPCC or the "scientists" and environmental extremists who author its climate assessments.

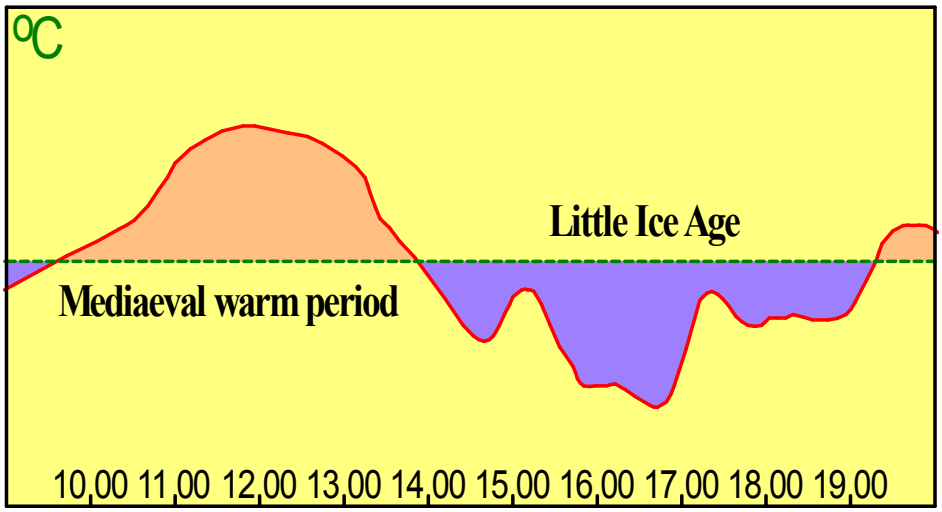
At some time or another, most people will have seen the hockey stick – the iconic graph which purports to show that, after centuries of stable temperatures, the second half of the 20th century saw a sudden and unprecedented warming of the northern hemisphere – a warming caused, we were told, by humankind burning fossil fuels and releasing carbon dioxide into the atmosphere –



The IPCC's infamous and now-discredited "hockey-stick" graph that falsely abolished the medieval warm period and enhanced by at least half the true temperature increase since 1980, giving the misleading impression that temperatures in the latter half of the 20th century were unprecedented in the recent history of the Earth. In fact, temperatures were warmer than the present for almost two-thirds of the past 10,000 years – most recently during the "medieval climate optimum", a warm period from about 950 to 1350 A.D. The "hockey stick" appeared in the IPCC's 2001 assessment report six times, and in full color, the only graph to be so favored. The graph was not based on science. It was a political statement.

Very briefly, we shall summarize the earlier stages in the campaign of disfiguring machination on the part of the climate "scientists" who – but for Steve McIntyre and his colleague Professor Ross

McKitrick – would have succeeded in gravely misleading the world's policymakers. We begin in 1990, when the IPCC clearly showed the existence of the medieval warm period in a graph in its first climate assessment –



The medieval warm period is correctly and prominently shown in the IPCC's 1990 report

The medieval warm period had in fact been up to 3 degrees Celsius warmer than today's temperatures, as numerous papers in the peer-reviewed literature clearly demonstrate. The best source for such papers is the Medieval Warm Period Database at www.co2science.org.

In 1995 a senior researcher into early climate told David Deming, a climate researcher, that "we have to abolish the medieval warm period" (Deming, 2005). Not "we need to re-examine the temperature record of the past millennium", but "we have to abolish the medieval warm period."

The existence of a prolonged warm period so recently in the Earth's climate history was making it impossible for the environmental extremists driving the "global warming" scare to convince the world's policymakers that today's comparatively temperate temperatures were anything to worry about. The "hockey stick", therefore, was a deliberate attempt to falsify the true climate record.

In 1998/9, in the journal *Nature,* three paleoclimatologists (Mann *et al.,* 1998, 1999) published the "hockey stick" graph. In 2001, the IPCC's climate report prominently featured the defective graph.

The IPCC's politicized bureaucrats liked the graph so much that they reproduced it six times, in very large scale, and in full color. The "hockey-stick" graph was the only graph in the entire 2001 assessment report that was reproduced as often as this.

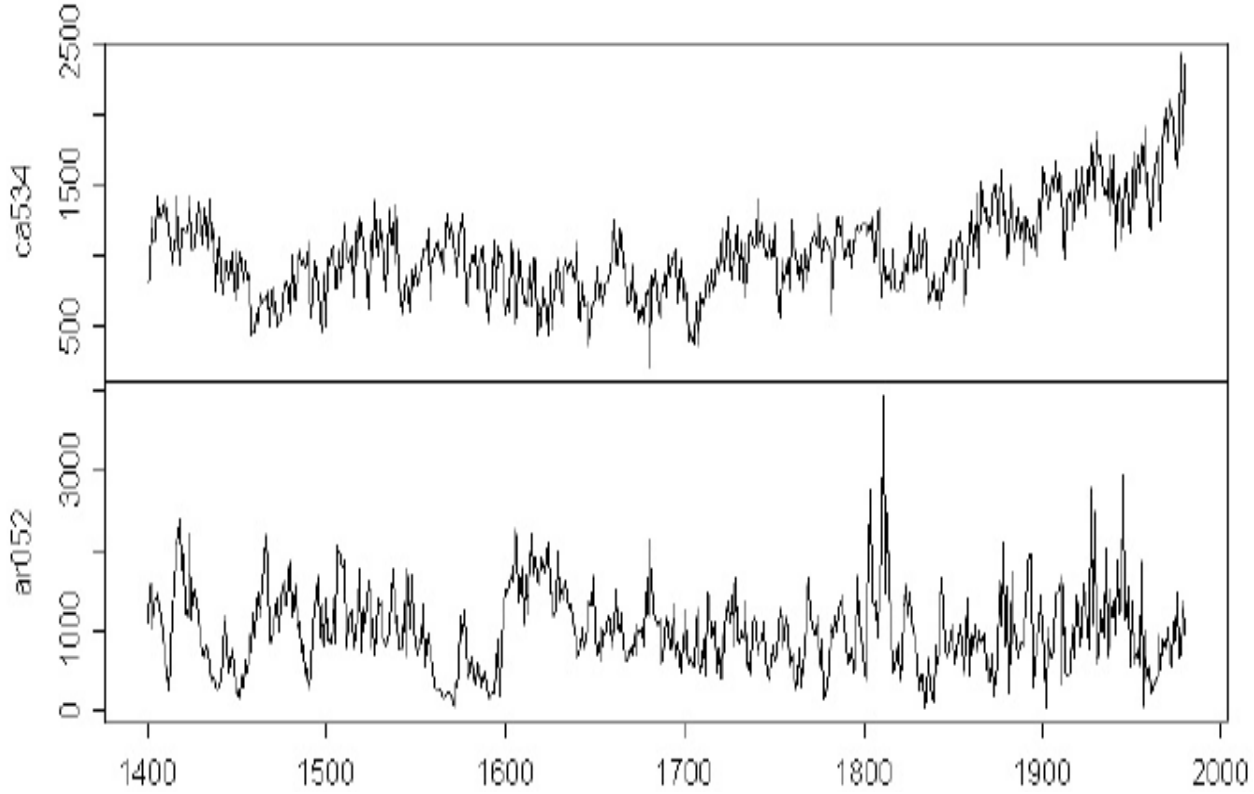
The fabricators of the graph had used the varying widths of tree-rings as their principal method of estimating early-climate temperatures. They had unwisely assumed that wider tree-rings always indicated warmer temperatures. However, the IPCC had previously – and correctly – given strong warnings against using tree-rings as proxies for pre-instrumental surface temperatures.

One reason for the IPCC's warnings was that wider tree-rings do not always indicate warmer temperatures. Trees grow faster not only when it is warmer but also when there is more carbon dioxide in the atmosphere, because carbon dioxide is not a pollutant but a naturally-occurring

substance that is plant food. With sunlight, chlorophyll, and water, it is an essential ingredient in plant photosynthesis, without which there would be little or no life on Earth.
Seen in a geological perspective, the pre-industrial concentration of carbon dioxide was almost as low as it has been in the past half-billion years. Indeed, even the present concentration is well below what has been the norm in recent geological history. In the Cambrian era, for instance, a diagram in the IPCC's 2001 assessment report shows that carbon dioxide concentration was almost 20 times that of today.

Tree-rings, therefore, were unsuitable because CO_2 fertilization distorted the data. The fabricators of the "hockey stick" nevertheless gave the unreliable tree-rings 390 times as much weight as any of the other data they used, because the tree-ring data, unlike the remaining paleoclimate data they had used in fabricating the graph, gave them the hockey-stick shape they wanted.

This shape allowed them to do what David Deming had been told that the environmentalist faction wanted to do – namely, to abolish the medieval warm period and pretend that today's temperatures were likely to have been unprecedented in the past 1000 years.

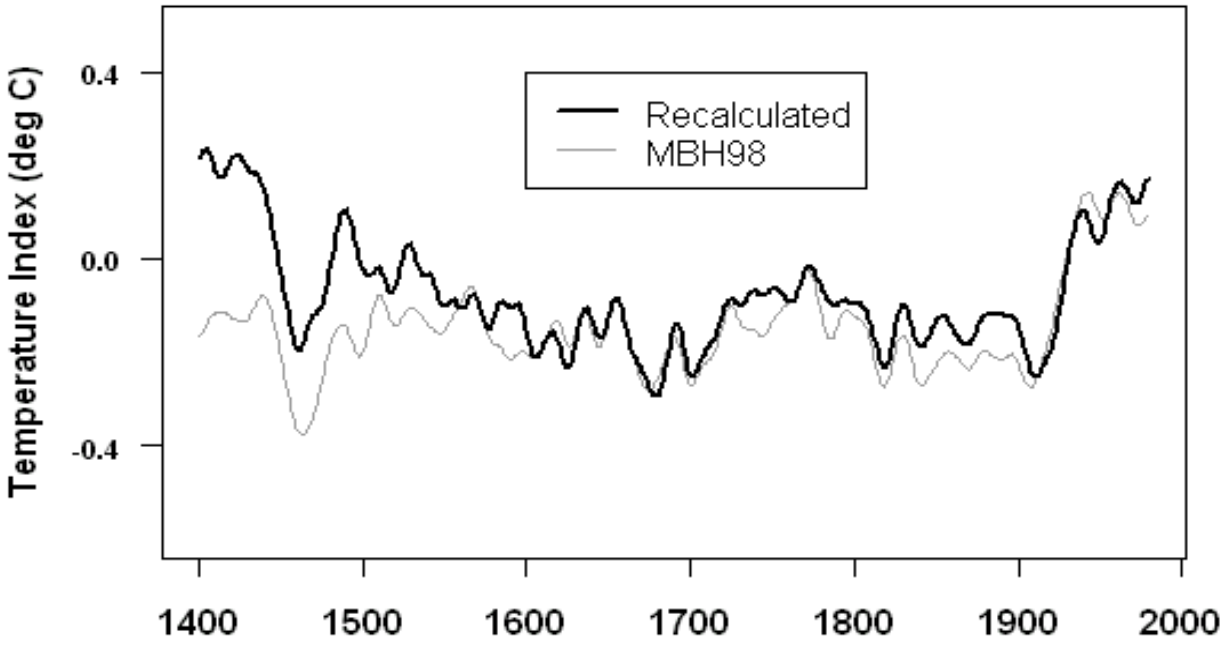


Tree-rings from Sheep Mountain, CA, that produced the desired "hockey-stick" shape, falsely suggesting a pronounced uptrend in the 20th century, ***(upper panel)*** *were given 390 times more weight than tree-rings from Mayberry Slough, AZ, that correctly suggested a far less dramatic picture* ***(lower panel)****. The IPCC had recommended against using tree-rings as the basis for reconstructing pre-instrumental surface temperatures on Earth because not only warmer weather but also increased carbon dioxide concentration accelerates the growth of trees and hence widens their annual growth-rings.*

Not only did the fabricators of the "hockey stick" use temperature proxies that the IPCC had said should not be used; not only did they give these questionable proxies almost 400 times more weight than proxies that did not give them the hockey-stick shape they wanted; but they then also left out the tree-ring dataset that included the medieval warm period itself.

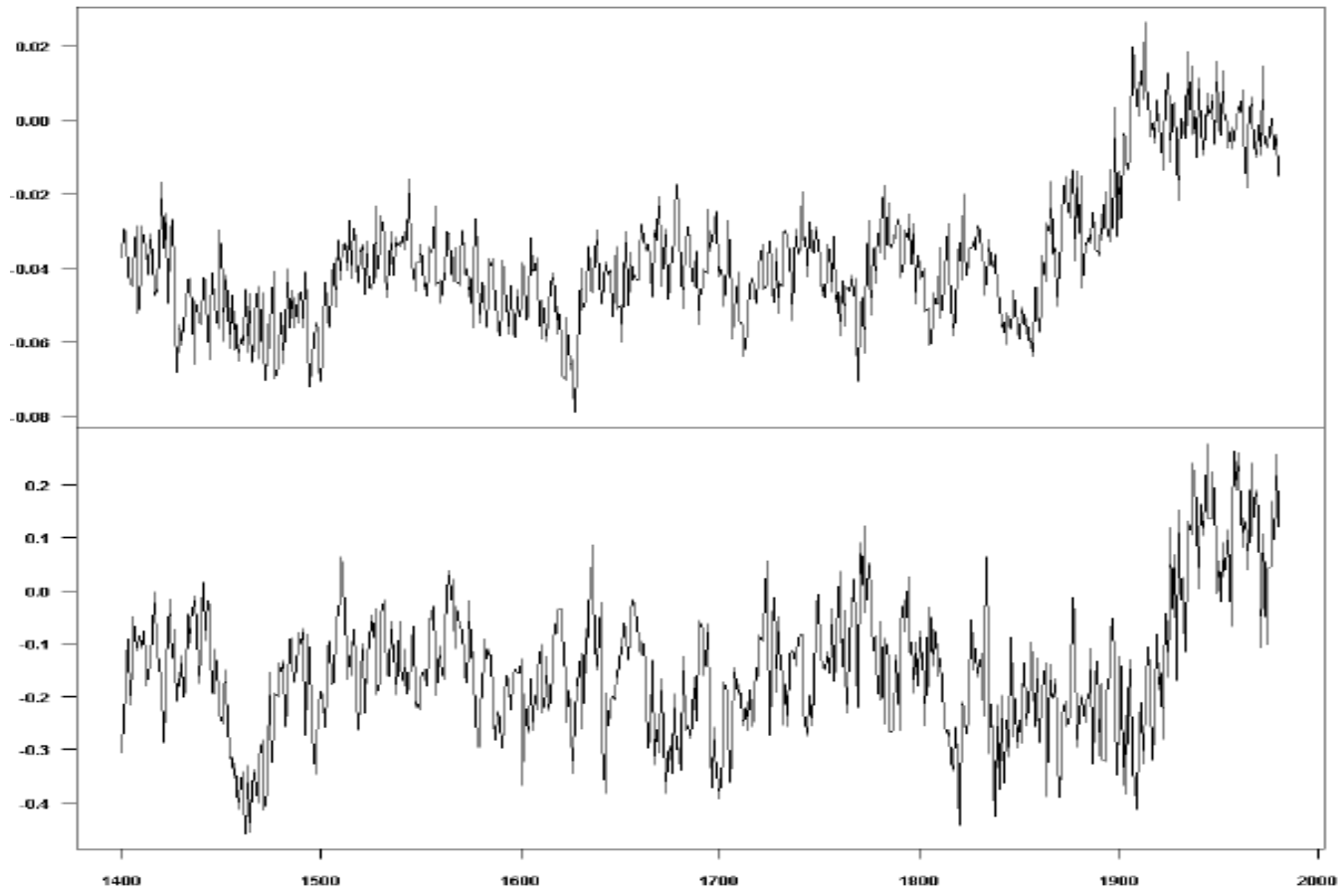
However, the graph's fabricators said in the "scientific" paper that accompanied their graph that they had included the tree-ring dataset for the medieval warm period that they had in fact omitted. Worse, they hid the missing data in a file on their own computer that they had revealingly labeled "**CENSORED_DATA**". They knew perfectly well that they were censoring the data. However, by saying they had used the data they had in fact censored and hence excluded, they hoped no one would ever find out. They reckoned without McIntyre and McKitrick, who, when the history of the now-collapsing climate scare comes to be written, will be remembered as having done more than anyone to expose the corruption at the heart of the discredited scientific case for climate panic.

The graph's fabricators inserted their own "estimates" in place of the data they had left out, but did not publish the fact that they had done so. Unsurprisingly, the "estimates" somehow succeeded in wiping out all evidence of the higher temperatures that had obtained during the Middle Ages. McIntyre and McKitrick later worked out that, if the omitted data from the medieval warm period were reinserted, evidence for the vanished medieval warm period instantly reappeared –



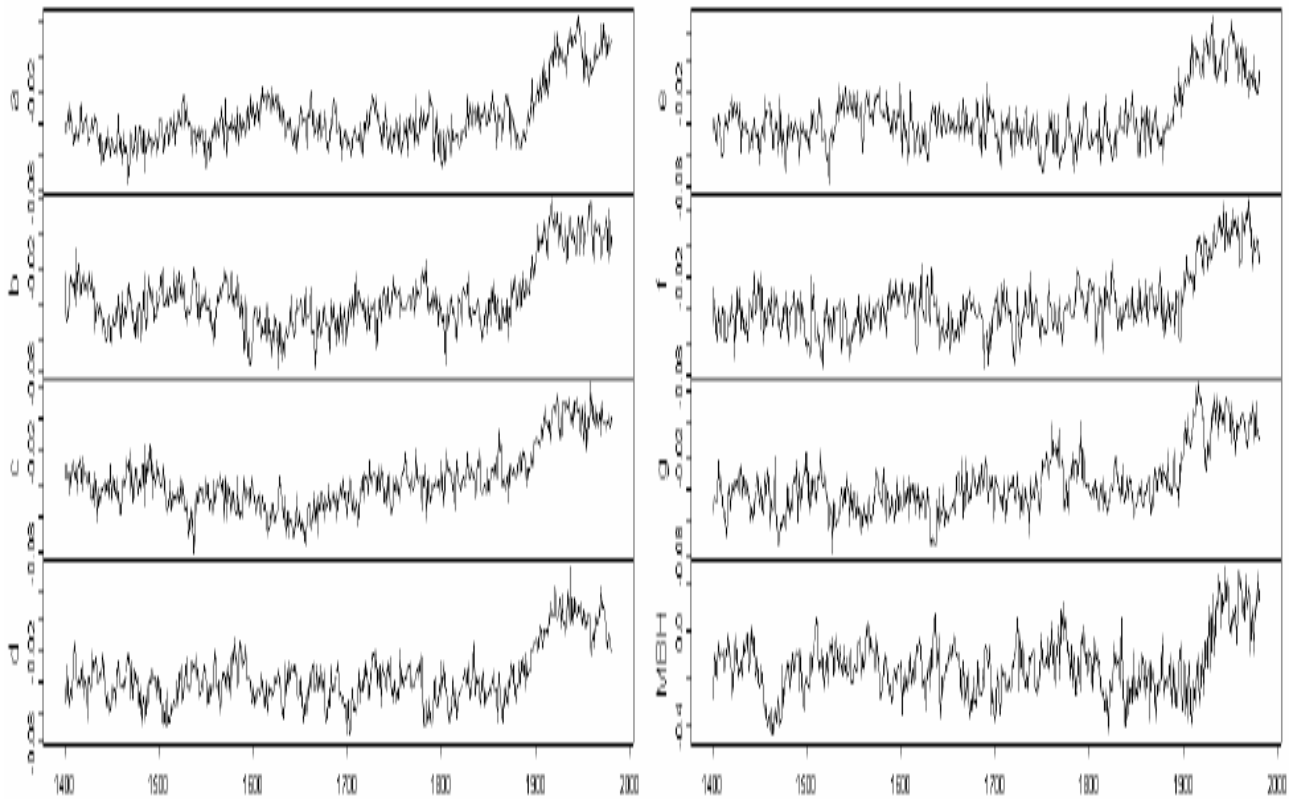
Restoring the "censored" data restores the medieval warm period (McIntyre & McKitrick, 2005)

Next, McIntyre and McKitrick obtained from the fabricators of the "hockey stick" the computer program and data they had used in compiling the fake graph. The computer program produced a "hockey-stick" graph almost every time, even if random "red noise" rather than real data were used –



Upper panel: *The graph using real temperature proxy data.* ***Lower panel:*** *The graph using random red noise. The two graphs are near-identical in shape, both resembling hockey sticks.*

McIntyre and McKitrick then decided to run the fabricators' computer program several times with different sets of random data. On almost every occasion, the computer program produced "hockey-stick" shapes that were indistinguishable from those constructed using real data –



Seven runs of the fabricators' defective computer model with random data and one with real tree-ring data. It is impossible to tell which graph is based on real data.

The peer-reviewers at *Nature* – scientists who were supposed to be experts in paleoclimatology – did not detect any of these serious defects in the methods the fabricators of the "hockey-stick" graph had used. The editors of *Nature* had already abused the convention of strict impartiality in scientific publications by declaring in print a prejudice in favor of the alarmist view about "global warming", and by strongly suggesting that in future no papers questioning that the alarmist theory would be published.

Likewise, the two rounds of "peer review" which preceded the IPCC's 2001 assessment report did not detect any of the defects either. However, it is important to understand that the IPCC's reports are not peer-reviewed in the accepted sense of the term. The reviewers are hand-picked by the IPCC, which has been known to veto the appointment of anyone known to have doubts about the alarmist position. And the authors of the IPCC's science chapters, uniquely in the scientific world, have – and frequently exercise – the right to overrule the peer-reviewers' recommendations. The IPCC tried to conceal the extent to which authors whose credentials are satisfactorily alarmist have been allowed to overrule serious and even fundamental criticisms by peer-reviewers: it initially sent all the reviewers' comments on its 2007 report, in hard copy only, to a library that was closed for renovation, so that no one could look at them for several months after publication. Eventually, but only under pressure, the IPCC agreed to allow the reviewers' comments to be published online. In the crucial chapter attributing recent warming to humankind, the authors had decided to reject more than half of all the reviewers' comments.

The IPCC relied heavily upon the defective hockey-stick graph as the basis for its conclusion that it may be warmer worldwide today than at any time in the past 1,300 years. Without the bogus graph, the truth as presented in the IPCC's 1990 report would have prevailed: the medieval warm period was

warmer, and in some places considerably warmer, than the present. Greenland, for instance, is one of the alarmists' favorite poster-children for climate panic. Headlines talking of unprecedented warming and sudden collapse of the vast Greenland ice sheet are commonplace. Yet the burial-ground in the principal medieval Viking settlement, at Hvalsey in south-western Greenland, is under permafrost to this day. It was certainly not under permafrost when the Vikings buried their dead there during the Middle Ages.

The IPCC's 2001 and 2007 reports carefully avoided pointing out that temperatures have been higher than today's throughout most of the past 10,000 years. Indeed, in the Bronze Age, during the Holocene Climate Optimum, which was called an "Optimum" because warmer weather is better for life on the planet than colder, temperatures were many degrees warmer than the present for several thousand years.

Nature, when asked, flatly refused to part with details of the data and methods used by the scientists who had created the defective graph. That refusal is directly contrary to the central principle of the scientific method, which is that the unpublished methods and data that underlie the published results of any scientist in any learned journal must be made available to other scientists so that they can replicate the methods and test whether the results are valid. However, *Nature,* having declared its unscientific prejudice in favor of the climate scare, no longer makes any pretence at being a proper learned journal of science. On this subject, at least, it is now merely another politicized mouthpiece of the international environmentalist extremists.

Worse, the fabricators of the false graph themselves also at first refused, time and again, to supply their data and programs. Eventually, and only after continuous pressure from McIntyre and McKitrick, they reluctantly made an untidy jumble of code and data available. It was among this jumble that the two researchers found the **CENSORED_DATA** file and many other questionable details.

When McIntyre and McKitrick first tried to publish their revelations about the numerous and serious scientific defects in the graph that abolished the medieval warm period and provided the central plank in the platform of climate panic that the IPCC had constructed in its 2001 report, *Nature* flatly refused to publish a paper drawing attention to them. Once again, the editors refused to take a scientific approach and allow anyone in their pages to suggest that they had been wrong. The two researchers also had great difficulty in persuading other leading scientific journals to publish the truth. Many of them, like *Nature,* had abandoned scientific objectivity in favor of a declared political bias in favor of climate panic.

Eventually, and only under pressure, *Nature* was compelled to publish a belated, muddled, and inadequate correction written, but only under pressure, by the fabricators of the bogus graph.

Geophysical Research Letters finally published a paper by the two determined researchers exposing the defects in the graph (McIntyre & McKitrick, 2005). This paper provoked astonishment and dismay throughout the climatological community. That was the first moment at which many honest scientists who had previously accepted the climate scare at face value began to question the methods and the motives of the handful of politicized scientists who, between them, were chiefly responsible for creating and promoting the now-failed scare.

So much controversy was generated by the two researchers' paper that three statisticians engaged by the US House of Representatives (Wegman *et al.,* 2005) were invited to examine the evidence on both sides. In a damning report, the statisticians confirmed all of the findings of McIntyre and McKitrick to the effect that the graph was defective. The statisticians also found that a suspicious collection of

subsequent papers that had suddenly appeared supporting the notion that the medieval warm period had not existed had nearly all been written by associates or co-authors of the inventors of the defective graph, and using similarly questionable data and methods.

A report by a committee of the US National Academy of Sciences also confirmed that the graph was defective, saying that its conclusion was no better than "plausible", and, witheringly, that it had "a validation skill not significantly different from zero" – in short, that scientifically speaking it was worthless. Very nearly all of the news media, when reporting the findings of the NAS, did not read the report itself but lazily based their stories only on the accompanying press release, which had been carefully drafted to exclude the NAS' finding that the graph was worthless, highlighting instead the notion that its conclusion as to the absence of the medieval warm period was "plausible". The media did not even mention the one caveat that appeared even in the politicized press release from the NAS – namely that all temperature proxies going back more than 400 years were inherently unreliable. Al Gore, absurdly unscientific as ever, even went so far as to declare that the NAS had "vindicated" the defective graph, when in fact it had found the graph valueless. Somehow the NAS found it expedient not to correct Gore's characteristic misstatement of the truth.

It is not only the medieval shank of the "hockey stick" that is defective. Professor McKitrick published papers in 2006 and in 2007 that demonstrated a clear correlation between varying levels of economic activity in different parts of the world and varying rates of temperature change in the past 50 years as recorded in the major global-temperature datasets, correctly inferring from this strong correlation that the compilers of the datasets, some of whom are among the most notorious promoters of the climate scare, had insufficiently adjusted the raw data to remove the false warming effects caused by increasing industrialization and urbanization. If these "urban heat island effects" had been properly removed from the data, there should have been no correlation between regional variations in economic activity and regional variations in the warming rate.

Notwithstanding the papers by McIntyre and McKitrick, the Congressional statisticians under Wegman, and the damning report by the NAS, the IPCC neither apologized for nor withdrew the defective graph. Instead, in defiance of all the norms of the scientific method, it continues to rely upon the "hockey stick" in its publications to this day. The first of Professor McKitrick's papers about the considerable overstatement of the warming rate since 1980 was published in good time to be mentioned in the IPCC's 2007 assessment report. The report indeed mentions it, but it is significant that the IPCC found it expedient to abandon its declared rule that its reports faithfully reflect the balance of arguments as published in the peer-reviewed learned journals. At the time when the IPCC's 2007 report was published, there had been no published challenge to Professor McKitrick's paper. However, its finding that the increase in global temperatures since 1980 had been flagrantly exaggerated in the major global-temperature datasets was as profoundly uncongenial to the IPCC's bureaucrats and politicized scientists as his earlier papers' conclusion that the medieval warm period had indeed been, as history records, a great deal warmer than the present. Therefore the IPCC simply stated, without being able to cite a single scientific authority or reason, that it proposed to disregard Professor McKitrick's finding.

The IPCC's original revelation of the 1000-year graph with its near-static temperatures until 50 years ago (the shaft of the hockey stick), followed by the apparently dramatic temperature rise in the last few decades (the blade of the hockey stick), was a key moment for many environmentalists. Al Gore, of course, used the graph in his flawed movie promoting the climate scare, and his carefully-selected audience dutifully greeted the graph with gasps of astonishment. However, like much else in Gore's movie, the graph was false.

How, then, has it come to pass that the IPCC continues to rely upon a graph that has been so thoroughly and utterly discredited, and so obviously fabricated on the basis of **CENSORED_DATA** that had been inappropriately selected, massaged, manipulated and run through a computer program that would produce a "hockey stick" shape even if the input data were random?

The lack of scientific integrity that led to the publication of the original graph is nothing when compared with the maneuvers and machinations that the IPCC has relied upon in finding excuses for covering up its deliberate previous use of a defective graph by the simple expedient of continuing to rely upon it in its current publications. I am grateful to Bishop Hill for the following account –

http://bishophill.squarespace.com/blog/2008/8/11/caspar-and-the-jesuspaper.html

McIntyre and McKitrick had rightly criticized the fabricators of the "hockey stick" for having refused to publish an essential statistical result known as the "cross-validation R^2", a measure of how well the fabricators' reconstruction of temperatures correlated with actual temperature records.

In May 2005, at the height of the controversy, and on the very day that McIntyre was making a rare public appearance in Washington to discuss his findings, two Mann associates, Caspar Amman and Eugene Wahl, issued a press release in which they claimed that they had submitted two manuscripts for publication, which together purported to show that they had replicated the hockey stick *exactly*, confirmed its statistical underpinnings and demonstrated that McIntyre's criticisms were baseless. This was trumpeted as "independent confirmation" of the hockey stick.

A few eyebrows were raised at the dubious practice of using a press release rather than a learned paper in a peer-reviewed scientific journal to announce research findings. On the rare occasions when this kind of announcement is made, it tends to be about papers that have been published, or have at least been *accepted* for publication. To make such a dramatic announcement about the mere *submission* of a paper was almost without precedent.

The first of these two allegedly confirmatory papers was submitted to *Geophysical Research Letters,* a journal of the American Geophysical Union. It was a purported rebuttal by Ammann and Wahl of a paper by Steve McIntyre criticizing the "hockey stick" in an earlier edition of the same journal.

The second, longer paper, also by Wahl and Ammann, had started its long road to publication at the journal *Climatic Change*. This article purported to be a replication of the hockey stick and confirmation of its scientific correctness. However, in a surprising turn of events, the journal's editor, prominent global warming [2 http://www.climateaudit.org/?p=204] catastrophist Steven Schneider, mischievously asked none other than Steve McIntyre to be one of the paper's anonymous peer reviewers.

In fairly short order, the paper by Ammann and Wahl was rejected by *GRL*, many of its criticisms either relating to other McIntyre papers than the one at hand, or relying on the still-unpublished paper in *Climatic Change* for their arguments. Since that paper was unpublished, it was effectively impossible for McIntyre to defend himself against these criticisms. Shortly after Ammann and Wahl's paper was rejected, a third attempted rebuttal of McIntyre's work, this time by David Ritson, a physicist, was also rejected by the journal's editors.

We have seen above that one of the chief criticisms of the hockey stick was the fact that its author, Michael Mann, had withheld key validation statistics so that it was impossible for anyone to gauge the reliability of his reconstruction of northern-hemisphere temperatures in the period before instrumental

measurements began. These validation statistics were to be key to the subsequent story. At the time of their press release, Wahl and Ammann had made public the computer code that they had used in their papers. By the time their paper was submitted to *Climatic Change*, McIntyre had reconciled their work with his own so that he understood every difference. And he therefore now knew that Wahl and Ammann's work suffered from exactly the same problem as the hockey stick itself: the R^2 number was so low as to suggest that the hockey stick had no meaning at all, although another crucial variable, the reduction-of-error statistic, was relatively high. It was only this latter figure that had been mentioned in the paper. Far from confirming the scientific integrity of the hockey stick, Wahl and Ammann's work actually confirmed McIntyre's criticisms of it! McIntyre's first action as a peer reviewer was therefore to request from Wahl and Ammann the verification statistics for their replication of the "hockey-stick" graph. Confirmation that the R^2 was close to zero would cast substantial doubt on Wahl and Ammann's replication.

Wahl and Ammann's response was similar to that of the fabricators of the original "hockey stick". They refused any access to their verification variables, flouting not only the journal's published rules but also the norms of the scientific method, which require that results published in learned journals be independently verifiable. As a justification for their extraordinary refusal, they said that they had rebutted McIntyre's criticisms in their forthcoming *GRL* paper, even though they knew perfectly well that the paper had been rejected by the journal some days previously.

At the start of July 2005, with his review of the *Climatic Change* paper by Ammann and Wahl complete, McIntyre took the opportunity to probe this point, by asking the journal to find out the anticipated publication date of the *GRL* paper. Wahl and Ammann were thereupon forced to admit the rejection, but they declared that it was unjustified and that they would seek publication elsewhere.

With the replication of the hockey stick in tatters, reasonable people might have expected some sort of pause in the political momentum. Seasoned observers of the climate scene, however, will be unsurprised to hear that global warming *eminences grises* like Sir John Houghton and one of the authors of the original "hockey stick" continued to cite the Wahl and Ammann papers, although their draft paper for *Climatic Change* had not yet been accepted and their draft paper for *GRL* had been rejected. Notwithstanding the rejection, the press release by Wahl and Ammann was not withdrawn.

Events soon took another surprising turn. It was announced that the editor-in-chief of *Geophysical Research Letters*, Jay Famiglietti, had taken over the file for the McIntyre paper and its responses. This was justified, he said, because of the high number of responses (just four) that the McIntyre paper had received. That two of those responses had been rejected and were no longer in play was not mentioned.

The reason for the change quickly became apparent hen, at the end of September, the rejected response from David Ritson turned out not only to have been re-submitted but had also been accepted for publication, but without any copy of it having been sent to McIntyre so that he could reply to it in the same issue. This was another clear breach of the journal's rules, which required that an article's author should be able to comment on responses before they were accepted. Famiglietti refused to make any on-the-record comments about why he had behaved as he did.

If McIntyre had any suspicions about the implications of Famiglietti's malfeasance, he must have been quite certain when, shortly afterwards, hockey stick author Michael Mann commented on his climate blog that both the *Climatic Change* and the *GRL* papers were going to be accepted for publication shortly. Sure enough, in the last week of September 2005, the *GRL* paper was resubmitted and revisions were made to the CC paper. Both papers were back in play again.

As 2005 neared its end, two important events loomed large. The first was the year-end deadline for submission of papers for the IPCC's Fourth Assessment Report on the state of the climate, and realization soon dawned on McIntyre and the observers of the goings-on at *GRL*: the IPCC *needed* to have the Wahl and Ammann papers in the report so that they could continue to use the hockey stick, with its frightening and unprecedented uptick in temperatures. Mountains were going to be moved to keep the papers in play.

The other important happening was the fall meeting of the American Geophysical Union, which would be attended by many of the big names in paleoclimate and at which both McIntyre and Ammann would be making presentations. McIntyre's plan was to use the question-and-answer session after Ammann's presentation to once again press for the R^2 number for the hockey stick, a figure that had never been released, though it had been repeatedly requested over the previous years by McIntyre, journals, politicians and journalists. When confronted, Amman once again prevaricated.

After the session, McIntyre attempted to clear the air by inviting Ammann to lunch. In the circumstances, this seems to have been a relatively amicable affair, but McIntyre's suggestion that he and Ammann write a joint paper outlining where they agreed and where they differed was not taken up. When McIntyre later formalized this offer in an email, Ammann failed even to acknowledge it.

While the AGU was meeting in San Francisco, Climate Change had provisionally accepted Wahl and Amman's *Climatic Change* paper, any objections which might have been raised by McIntyre swept aside by the simple expedient of not inviting him to review the second draft.

The resubmitted version of the paper turned out to be almost identical to the old one, http://www.climateaudit.org/?p=492#more-492, except that a new section on the statistical treatments had been added, presumably as a condition of acceptance. And here there was an upside because, buried deep within the paper, Amman and Wahl had quietly revealed their verification R^2 figures, which were, just as McIntyre had predicted, close to zero for most of the reconstruction, strongly suggesting that the hockey stick had little predictive power. Their decision to reveal these key data is necessarily obscure, but may well have been prompted by McIntyre's decision to file a complaint of academic misconduct about Amman with his employers, UCAR. Although the complaint was rejected, it may well have put sufficient pressure on Ammann and the journal to show the numbers that everyone wanted to see.

The *Climatic Change* paper's provisional acceptance date was December 12 2005, just a few days before the deadline for papers to be mentioned in the IPCC's *Fourth Assessment Report*. Strangely, the version that was accepted seems to have been dated 24 February 2006: therefore, according to its rules the IPCC should not have been able to consider it.

What is more, it appears that the new sections discussing the statistical verifications were only added in this post year-end version. As McIntyre put it:

> So under its own rules, is IPCC allowed to refer to Ammann and Wahl [2006]? Of course not. Will they? We all know the answer to that. When they refer to Ammann and Wahl [2006], will they also refer to its confirmation of our claims about [the authors of the original graph's] verification R^2 statistics? Of course not. That information was not available to them in December. But wait a minute, if Ammann and Wahl was in press in December, wouldn't that information have been available to them? Silly me.

In other words, the version of the paper which had gone forward to the IPCC had not included the adverse verification statistics, but the version accepted by the journal had. The IPCC got their rebuttal of McIntyre and the journal got a fig-leaf of respectability to cover up its duplicity.

By March 2006, the *Climatic Change* paper by Wahl and Ammann had been fully accepted, but there was to be another hiccup that would threaten it. After all the shenanigans at *GRL* with the replacement of the editor and the resubmission of letters, the journal decided once again to reject Wahl and Amman's attempt to rebut McIntyre's work. Ostensibly this was because the arguments were "already out there", but the truth was surely that there were so many holes in the statistical arguments as to make their publication an embarrassment to the journal.

This new rejection was a problem for the *Climatic Change* paper, as I will explain below. When using an R^2 verification, researchers can refer to tables of benchmarks to gauge the significance of their results. Now that the fact that the hockey stick and Amman and Wahl's replication of it were public, Ammann was arguing that the correct measure of significance was in fact the alternative reduction-of-error statistic. His problem was that, for reduction-of-error statistics, there are no tables of benchmarks for the researcher to refer to – he has to establish a benchmark of his own by other means. And Amman had done this in the *GRL* paper which had just been http://www.climateaudit.org/?p=564 6 http://www.climateaudit.org/?p=578 7 http://www.climateaudit.org/?p=592 rejected. Without the *GRL* paper, he had no basis at all for his argument that his results in *Climatic Change* were statistically significant.

There is a rule of thumb for reduction-of-error statistics: this says that positive reduction-of-error numbers have some significance while negative ones do not. Unfortunately for Ammann, this rule applies only to linear regressions; as the hockey stick was clearly not linear, it could not apply. The original hockey-stick fabricators had claimed to have created a benchmark through other means, and that the figure was still zero. Now Ammann and Wahl, while they had been silent on the issue in their original *GRL* submission, announced in their resubmission that they had performed benchmarking calculations that had confirmed that the significance level for the reduction-of-error statistic should remain at zero.

However, now that the resubmission had been rejected by *GRL*, the "establishment" of this benchmark was set at nought, and the statistical arguments in their *Climatic Change* paper which relied on it could no longer be maintained. And then silence. A year later, the *Climatic Change* paper was nowhere to be seen, although it had been accepted for publication. It was stuck in a kind of publishing limbo once again. This left the IPCC and *Climatic Change* with a problem. McIntyre observed:

> "I'm intrigued as to what the final Wahl and Ammann version will look like. They have an intriguing choice: the inclusion of a reference to this article in [the IPCC's *Fourth Assessment Report*] was premised on their article [in *Climatic Change*] being "in press", which would prohibit them from re-working their article to deal with the *GRL* rejection. But the article needs to be re-worked, since it will look pretty silly to describe their *GRL* article as "under review" more than 18 months after it has been rejected."

In the background, however, much had been happening. Suddenly in September 2007, and with the IPCC report published, the *Climatic Change* paper suddenly appeared, preceded in the same journal by *another* paper by the same authors. What had happened was that Wahl and Ammann were quietly allowed to rewrite their rejected *GRL* paper and submit it to *Climatic Change* instead. All reference to the rejected *GRL* paper in the *Climatic Change* paper could be replaced by reference to the new paper. With identical authorship, and a maze of cross-references between them, the two *Climatic Change*

papers might have been carefully designed to make any understanding of how their arguments relied circularly on each other as difficult as possible.

The beauty of this approach was that it allowed for retention of the original acceptance date for the *Climatic Change* paper, and hence its inclusion in the IPCC process. It did leave Wahl, Ammann, and the IPCC with the embarrassing problem that a paper that had allegedly been accepted in March 2006 relied upon another paper that even the journal itself said had only been received in August 2006, and, in reality, was even later than that. Readers should note that this *matters* because unless the paper was had been accepted by the journal by the deadline for inclusion in the IPCC's *Fourth Assessment Report*, it should not have been referenced by the IPCC at all. But the IPCC desperately needed the *Climatic Change* paper; and although the inconsistency was pointed out, the IPCC merely waved the objections aside as irrelevant.

The *Climatic Change* paper argument leads from the text, to the appendix and then onto the resurrected *GRL* paper, which itself referred back frequently to the *Climatic Change* paper, creating a logically flawed, circular argument. One notable feature of the two papers by Ammann and Wahl was that they relegated some of their key argumentation to their Supplementary Information sections, which were online appendices to the published papers. In particular, the resurrected *GRL* paper stated that the statistical discussions and, more precisely, the establishment of reduction-of-error benchmarks could be seen there. To have key arguments available only in the online Suppelementary Information was most unusual and it quickly became apparent why this curious route had been followed: the Supplementary Information was not in fact available. Even the peer reviewers appear not to have had access: yet they had nevertheless cleared for publication the two papers which made no sense without it. Once again, Ammann refused McIntyre's request for the data and code. His reply to this request was startling, particularly bearing in mind that Ammann is a public servant:

> "Under such circumstances, why would I even bother answering your questions, isn't that just lost time?"

Again, everything fell silent. For the next year nothing more was heard of the two papers. McIntyre pressed from his blog for release of the Supplementary Information, and the politicians of the environmentalist lobby were able to take rapid advantage of the political space created by the IPCC report. Then, in the late summer of 2008, and entirely unannounced, Wahl and Ammann's Supplementary Information suddenly appeared on Caspar Ammann's website, some *three years* after that first press release announcing the "refutation" of McIntyre's work. With it, and a godsend to McIntyre, was the code used to establish the benchmark for the reduction-of-error statistic. With no more than a few days' work, McIntyre was at last able to establish exactly what had been done.

Recall that Ammann and Wahl had said they had established a benchmark of zero for a 99%-significant reduction-of-error score – that is to say, there is only a 1% chance that that score could have arisen merely by chance. McIntyre had, much earlier, shown that if red noise rather than real data were run through the algorithm, reduction-of-error scores of more than 0.5 were readily achievable. (Red noise is best described as a "random walk" – a line which wiggles at random, but is not entirely random like white noise.) To reduce the chance of random error to 1%, a minimum reduction-of-error score of 0.54 was essential. How Amman had come up with *zero* as his benchmark had been a mystery.

Now, with the code in front of him, McIntyre could see exactly what Wahl and Ammann had done. And what they had done was to calculate almost exactly the same figure as he had! The number they had arrived at was 0.52, just a whisker away from McIntyre's own 0.54, but they had reported to the

world that it was sufficient only to score a positive number! Of course, this wasn't picked up by the peer reviewers because, as we have seen, they had no access to the Supplementary Information.

Nevertheless, the IPCC's purposes had been served – the hockey stick found its way intact into the *Fourth Assessment Report*, unscathed by skirmishes with inconvenient statistical truths. However, the figure of 0.52 was insufficient for Wahl & Ammann's purposes. Their problem was that the key component of the hockey stick had a verification reduction-of-error statistic of 0.48, leaving it tantalisingly just below the verification threshold they had themselves calculated. They needed it to be in the top rank. Getting it there was going to be tricky. For each simulation, a thousand runs through the statistical sausage machine were perfomed and the reduction-of-error value, the correlation with the temperature record, was recorded. Then all the runs were sorted in order of reduction-of-error value, the best runs having the highest reduction of error and the worst the lowest. Wahl and Ammann needed to show that the hockey stick's reduction-of-error value was right up there with the best simulations – in the top 1%. While its reduction-of-error value was high, it was not high enough. And it was no good simply removing runs which had a higher score than the hockey stick, since this would not increase its position enough – they would have been reducing the total number of runs as well as the number of runs which were scoring better than the hockey stick. To get the answer they needed, the higher-scoring runs had to be made to be lower than the hockey stick, but left in the calculation.

To do this, Wahl and Ammann came up with a kludge which they called a calibration/verification reduction-of-error ratio. As the name suggests, this was the ratio of the reduction-of-error values for calibration and for verification. This ratio is, however, entirely unknown to statistics, or to any other branch of science. But it was not plucked out of the air. The ratio and the threshold value set for it by Wahl and Ammann was carefully calculated. They argued that any run with a ratio less than 0.75 should be assigned a score of –9999. Since the hockey stick had a score of 0.813, 0.75 was close to the highest level that could be set without rejecting the hockey stick itself.

However, if they had set their ratio threshold too low, not enough runs would have been rejected and the hockey stick would no longer be "99% significant". Some of the results of this ratio were entirely perverse – it was possible for a run that had scored a reasonably good reduction-of-error value in the calibration, showing that there was a good correlation between it and the actual temperatures, to be ejected from the final assessment on the ground that it had done *very* well in the verification – in short, that the correlation with actual temperatures was considered too good!

With this new and entirely arbitrary statistical prestidigitation in place, Wahl and Ammann were able to reject several of the runs which had stood between the hockey stick and what they saw as its rightful place as the gold standard for climate reconstructions. That the statistical foundations on which they had built this paleoclimate castle were a swamp of misrepresentation, deceit, concealment and malfeasance was, to Wahl and Ammann, an irrelevance. For political and public consumption, the hockey stick still lived, ready to guide political decision-making for years to come.

Was the medieval warm period warmer than today?

The false hockey-stick graph relied upon so very heavily by the IPCC in its 2001 and 2007 reports has been rejected, for very good reasons, as having "a validation skill not significantly different from zero". In short, the hockey stick, for all the squirming and wriggling of its fabricators and of their associates, and for all the dishonesty and deception perpetrated by the editors and peer-reviewers of several once-learned journals that are on the climate issue no more than political soap-boxes for environmental extremism dressed up to look as though it were science, does not tell us anything. It does not tell us that there was no medieval warm period, as its fanatical but scientifically-dubious supporters in and around the IPCC have tried to claim.

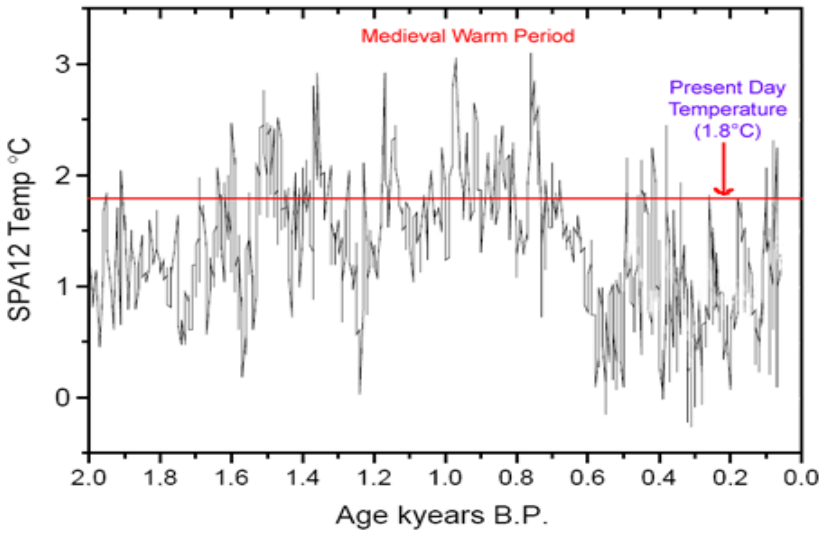
Precisely because the hockey stick is valueless, we cannot even use its rejection by all serious scientists to demonstrate that the Middle Ages were warmer than the present. Therefore we need to get away from the statistical games played by the graph's fabricators and by those, closely linked with them by previous joint authorship of papers in the learned journals, who have dishonestly come to their aid.

Instead, we need to examine the wider peer-reviewed literature, not to create statistical compilations from the proxy temperature records, but to examine the original proxies themselves, excluding the tree-ring proxies that are known to be useless because CO_2 fertilization accelerates tree growth in the same way as rising temperature accelerates it.

All the papers referenced below present graphs that provide visual confirmation of the existence of the medieval climate optimum or warm period in every region of the planet.

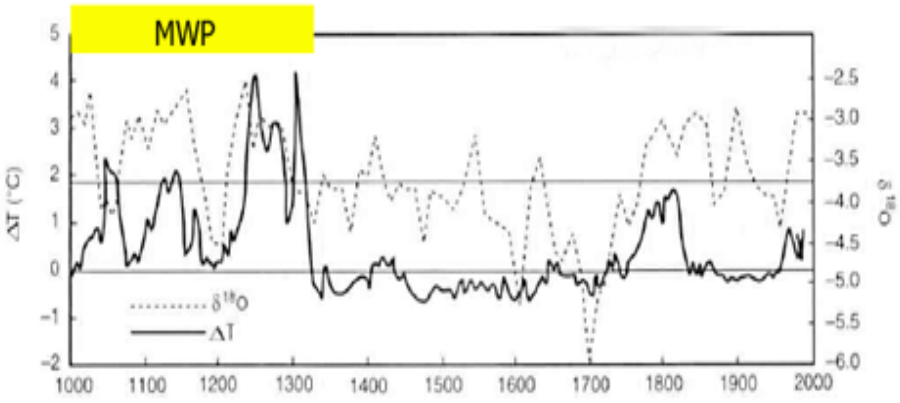
Spannagel Cave, Central Austrian Alps

Mangini *et al*. (2005) developed a highly-resolved 2000-year record of temperature with better than decadal resolution from a stalagmite recovered from Spannagel Cave in the Central Alps of Austria (47.09°N, 11.67°E). The highest temperatures of the past two millennia occurred during the Medieval Warm Period (AD 800-1300) and were "slightly higher than those of the top section of the stalagmite (1950) and higher than the present-day temperature." In fact, at three different points during the medieval warm period, their data indicate temperature spikes in excess of 1°C above present (1995-1998) temperatures.



Cold Air Cave, Makapansgat Valley, South Africa

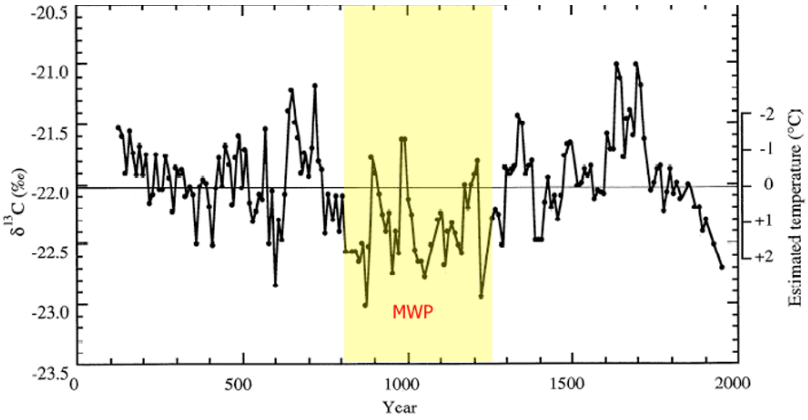
Tyson *et al.* (2000) reported that maximum annual air temperatures in the vicinity of Cold Air Cave (24°1'S, 29°11'E) in the Makapansgat Valley of South Africa were inferred from a relationship between color variations in banded growth-layer laminations of a well-dated stalagmite and the air temperature of a surrounding 49-station climatological network developed over the period 1981-1995, as well as from a quasi-decadal-resolution record of oxygen and carbon stable isotopes. The medieval warm period (AD 1000-1325) was as much as 3-4°C warmer than the Current Warm Period (AD 1961-1990 mean).



Makapansgat Valley proxy temperature reconstruction adapted from Tyson et al.
MWP is represented by the yellow highlighted bar at the top of the graph.

Yakushima Island, Southern Japan

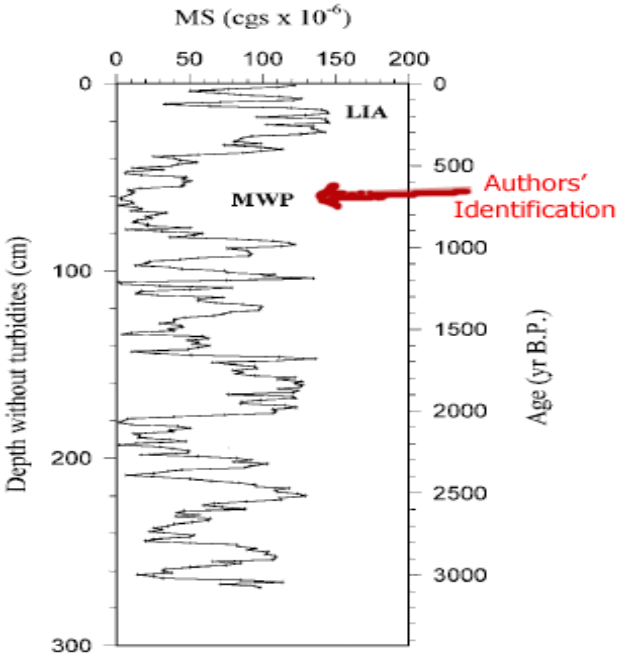
Kitagawa and Matsumoto (1995) analyzed $\delta^{13}C$ variations of Japanese cedars growing on Yakushima Island, southern Japan (30°20'N, 130°30'E), to reconstruct a high-resolution proxy temperature record over the past 2000 years. The Medieval Warm Period occurred between AD 800-1250 and from the authors' Figure 3, peak warmth during this time was about 1°C above that of the Current Warm Period.



Proxy temperature record obtained from a δ13C record of a giant Japanese cedar tree on Yakushima Island, Japan indicating peak warmth of the MWP was about 1.0°C above that of the Current Warm Period. Adapted from Kitagawa & Matsumoto (1995).

Eastern Bransfield Basin, Antarctic Peninsula

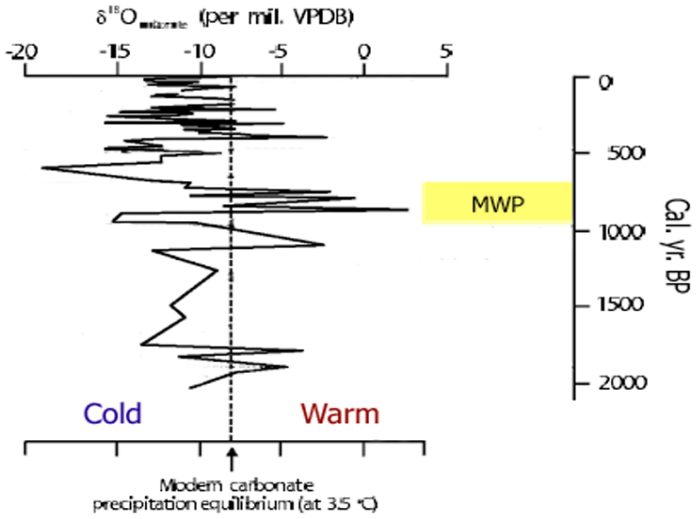
Khim *et al.* (2002) inferred general climatic features from a study of the grain size, total organic carbon content, biogenic silica content and, most importantly, magnetic susceptibility of ^{210}Pb- and ^{14}C-dated sediments retrieved from the eastern Bransfield Basin (61°58.9'S, 55°57.4'W) just off the northern tip of the Antarctic Peninsula. Most of the Medieval Warm Period (AD 1050-1550) was warmer than the Current Warm Period –



High-resolution magnetic susceptibility stratigraphy showing the author's identification of the MWP from the eastern Bransfield basin, Antarctica. Adapted from Khim et al.

Sombre Lake, Signy Island, Maritime Antarctica

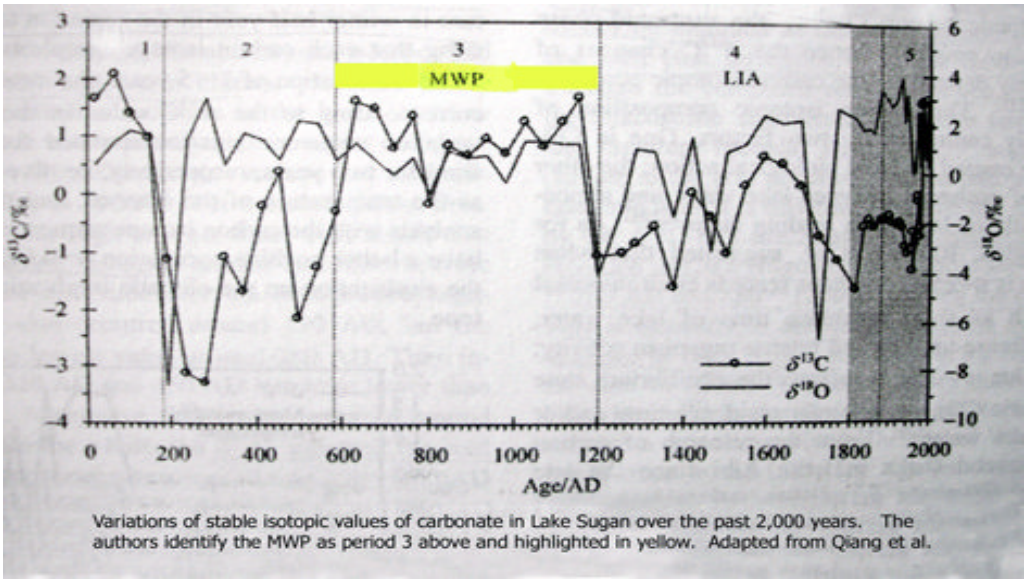
Noon *et al.* (2003) inferred primarily summer climatic conditions from a $\delta^{18}O$ record preserved in authigenic carbonate retrieved from sediments of Sombre Lake (60°43'S, 45°38'W) on Signy Island, maritime Antarctica. The Medieval Warm Period (AD 1130-1215) was warmer than the Current Warm Period –



Sombre Lake δ18Ocarbonate record showing the relative warmth of the MWP compared to the CWP. Adapted from Noon et al.

Lake Sugan, Northern Tibet

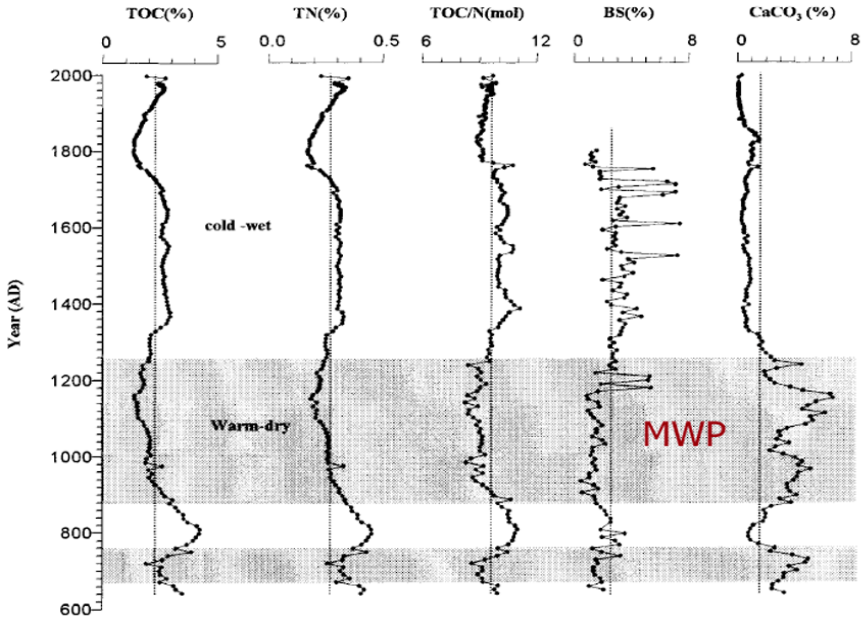
Qiang *et al.* (2005) conducted stable carbon isotope analyses on sediment cores taken from Lake Sugan (38°51.19'N, 93°54.09'E) in the NE Tibetan Plateau to produce a proxy of winter temperatures over 2,000 years. The results indicated a warm and dry period between 580 and 1200 AD, which they state "corresponds to the Medieval Warm Period." A view of the data in the author's Figure 3 reveals the medieval warm period was probably at least as warm between ~AD 1100 and 1200 as it is presently –



Variations of stable isotopic values of carbonate in Lake Sugan over the past 2,000 years. The authors identify the MWP as period 3 above and highlighted in yellow. Adapted from Qiang et al.

Lake Huguangyan, Leizhou Peninsula, Tropical South China

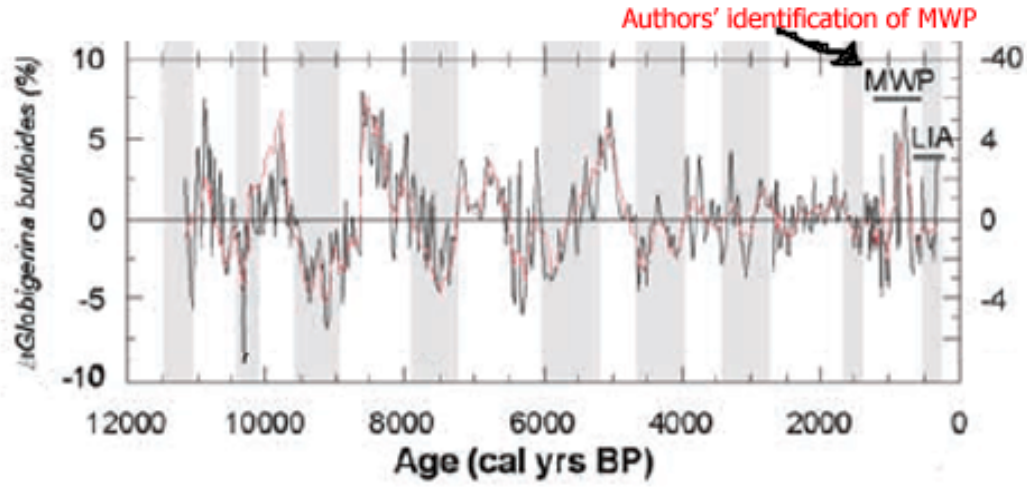
Chu *et al.* (2002) derived a climatic history from the geochemistry of dated sediments taken from Lake Huguangyan (21°9'N, 110°17'E) on the Leizhou Peninsula of South China, as well as from information contained in historical documents. The Medieval Warm Period occurred between AD 900 and 1300-



Sediment core properties from Lake Huguangyan from which the authors identify the MWP (~900-1300 AD). Adapted from Chu et al.

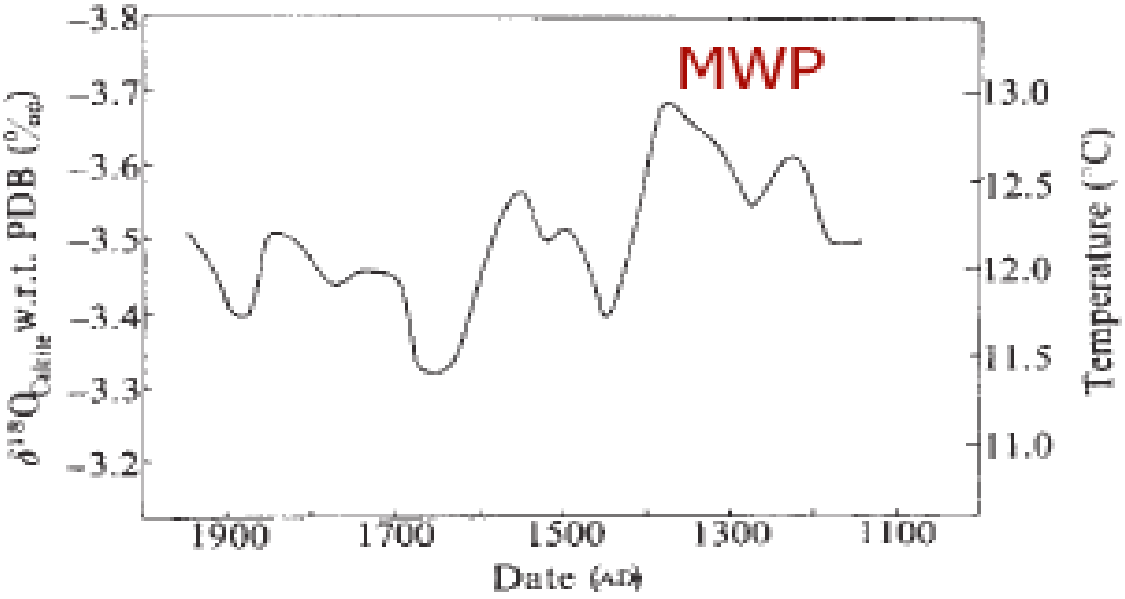
Northwestern Arabian Sea, Oman

Gupta *et al.* (2005) derived a high-resolution record of variations in the Indian summer monsoon from relative abundances of the planktic foraminifer *Globigerina bulloides* which they had obtained from a sediment core off the coast of Oman in the northwestern Arabian Sea (18°03.08'N, 57°36.56'E), indicating that southwest monsoon winds were stronger during the Medieval Warm Period (AD 800-1300), coincident with a period of high solar activity –



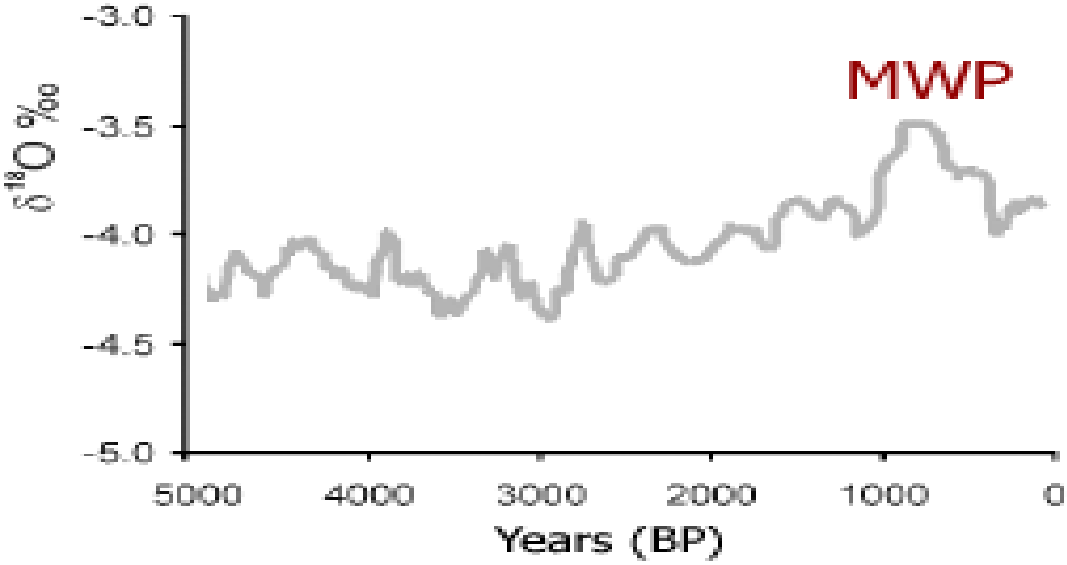
New Zealand

Wilson *et al.* (1979) derived temperatures from an $^{18}O/^{16}O$ profile through a stalagmite found in a New Zealand cave (40.67°S, 172.43°E), revealing the medieval warm period to have occurred between AD 1050 and 1400 and to have been 0.75°C warmer than the current warm period –



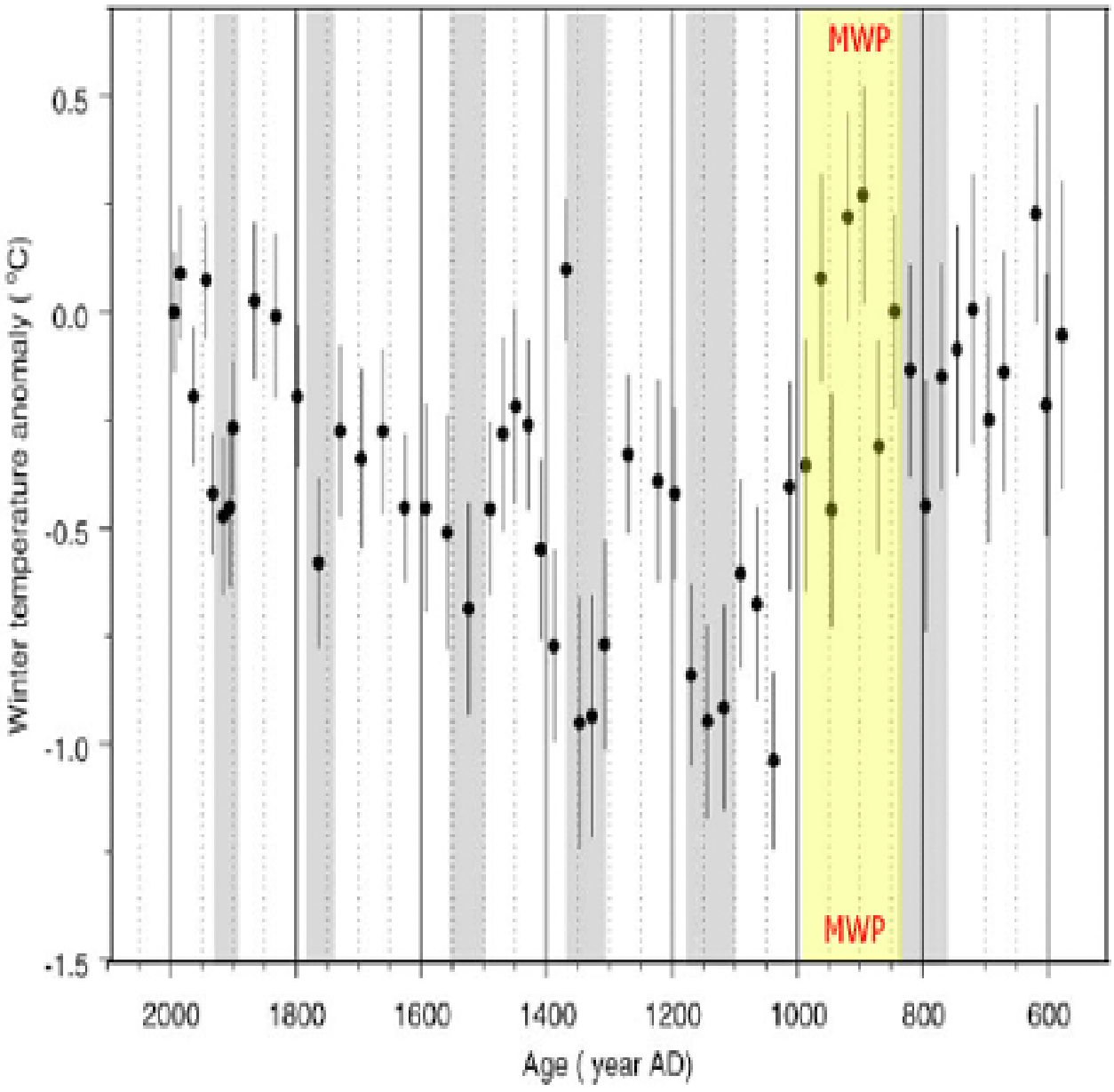
Waitomo, North Island, New Zealand

Williams *et al.* (2005) inferred temperatures from $\delta^{18}O$ data obtained from four stalagmites found in caves at Waitomo (38.3°S, 175.1°E) on New Zealand's North Island for which 19 TIMS uranium series ages were measured. The Medieval Warm Period occurred between AD 1100 and 1400 and was warmer than the Current Warm Period –



Lake Redon, Central and Eastern Pyrenees, Northeast Spain

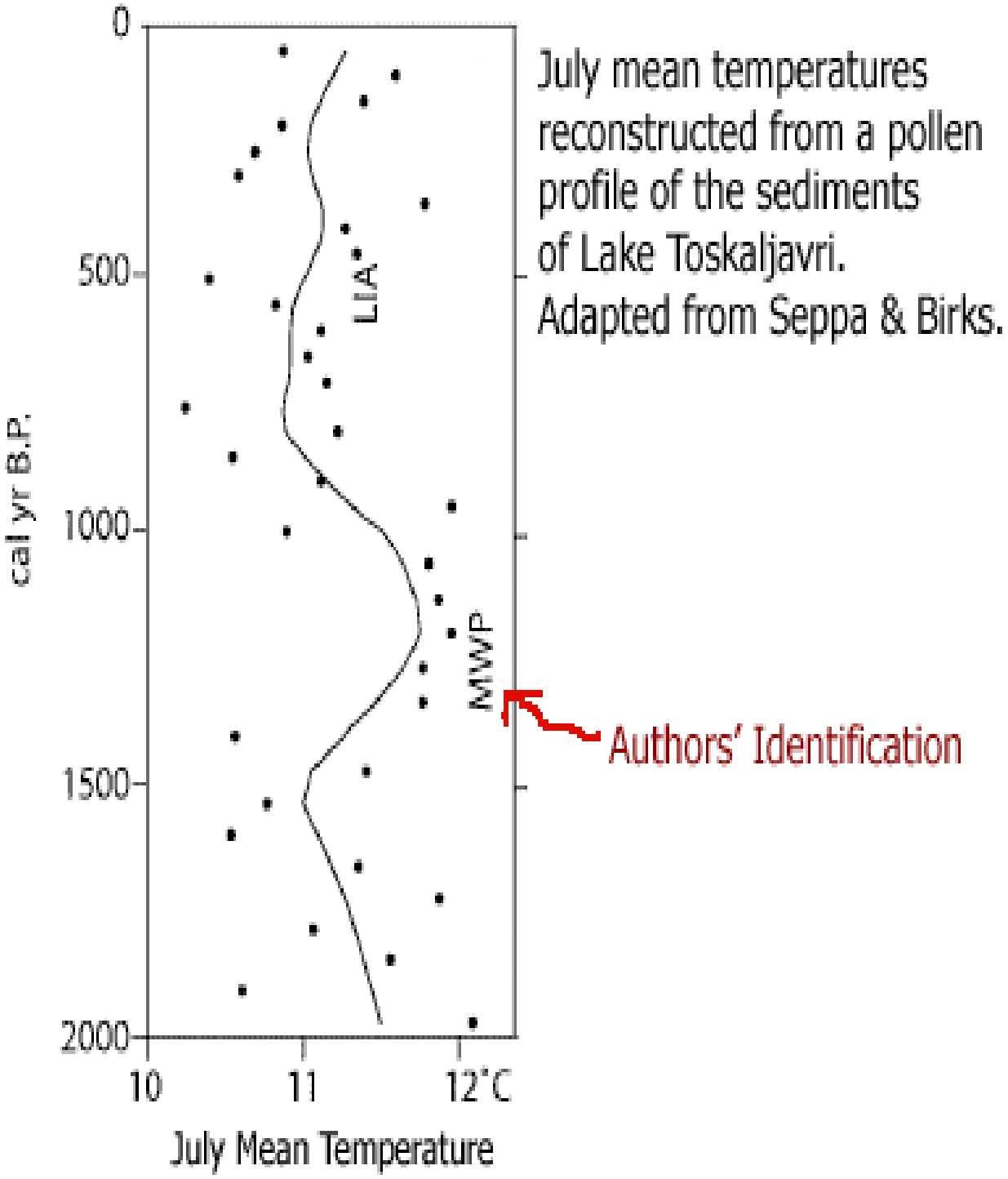
Pla and Catalan (2005) analyzed chrysophyte cyst data collected from a sediment core obtained from Lake Redon (42.64°N, 0.77°E) in the Central and Eastern Pyrenees of northeast Spain, producing a history of winter/spring temperatures for this region throughout the Holocene. The medieval warm period (~ AD 875 to 1000) was categorized as the "warmest period" of the record, with temperature about 0.25°C warmer than it is currently –



Altitude anomaly reconstruction from the authors' chrysophyte record converted into winter/spring mean temperatures for the last 1,500 years. Adapted from Pla and Catalan (2005).

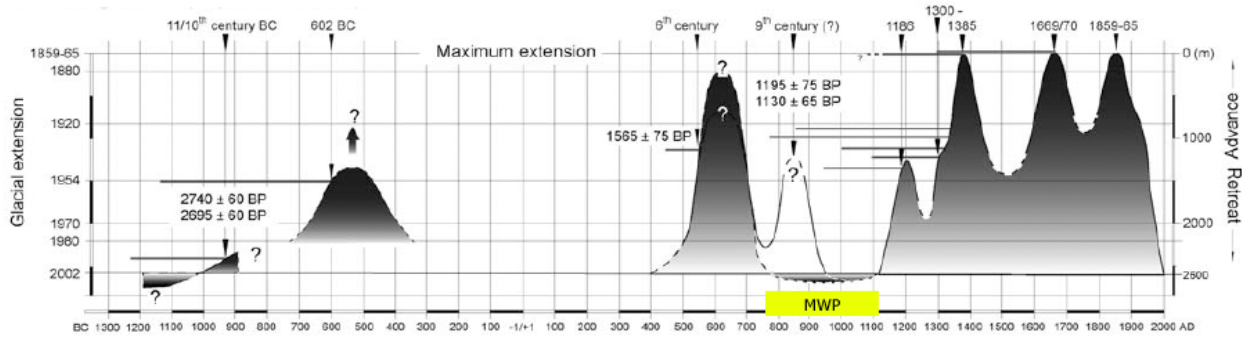
Toskaljavri, Fennoscandia

Seppa and Birks (2002) reconstructed July mean temperatures from a pollen profile of the sediments of Toskaljavri (69°12'N, 21°28'E), a tree-line lake in the continental sector of northern Fennoscandia. The medieval warm period occurred between AD 600 and 1000 and was 0.8°C warmer than today –



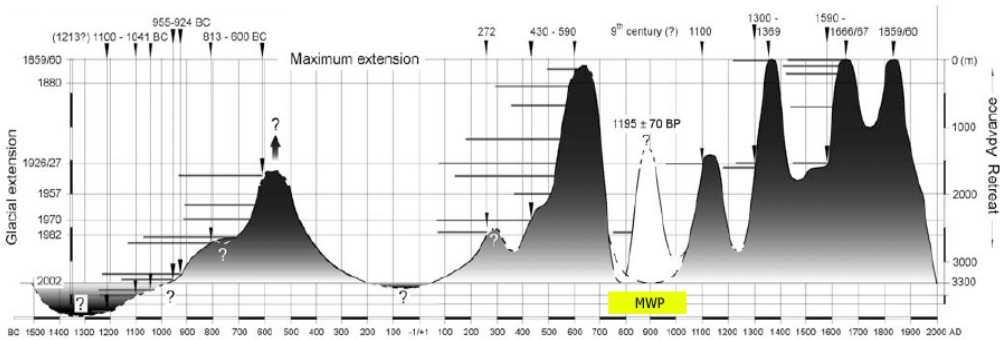
Gorner Glacier, Swiss Alps

Holzhauser *et al*. (2005) present a high-resolution record of glacial variation for Gorner glacier, in the Swiss Alps (~46.05°N, 7.62°E), as part of an effort to develop a 3500-year climate history of west-central Europe. In their estimation, "at no other glacier in the Swiss Alps ... [is] the Medieval Climatic Optimum so well documented as at the Gorner glacier," especially when the glacier retreated to levels beyond that of the present-day between AD 800 and 1100. Because glaciers in mountain areas are "highly sensitive to climate changes and thus provide one of nature's clearest signals of warming or cooling and/or dry and wet climate periods," as they describe it, "one can say that the quasi periodical fluctuations of Alpine glaciers were driven by glacier-hostile (warm/dry) and glacier-friendly (cool/wet) periods." On this basis, therefore, one can cautiously conclude that temperatures at Gorner Glacier were likely warmer during the Medieval Warm Period than they have been recently.



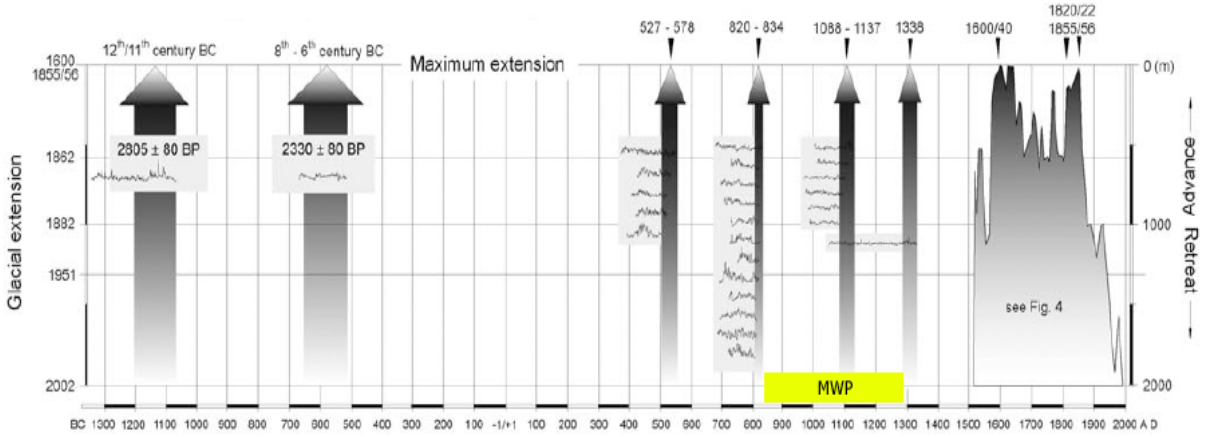
Great Aletsch Glacier, Swiss Alps

Holzhauser *et al*. (2005) also present a high-resolution record of glacial variation for the Great Aletsch glacier in Swiss Alps (~46.38°N, 7.75°E), as part of an effort to develop a 3500-year climate history of west-central Europe. As they describe it, the Medieval Warm Period occurred between AD 800 and 1300; and based on data presented in their Figure 2 (reproduced below), glacial extension between AD 800 and 1000 was at a level equal to that of today. Furthermore, because glaciers in mountain areas are "highly sensitive to climate changes and thus provide one of nature's clearest signals of warming or cooling and/or dry and wet climate periods," in their estimation, they state that "one can say that the quasi periodical fluctuations of Alpine glaciers were driven by glacier-hostile (warm/dry) and glacier-friendly (cool/wet) periods." On this basis one can logically, albeit cautiously, conclude that temperatures during the Medieval Warm Period were likely as warm as they are today at the Great Aletsch Glacier.



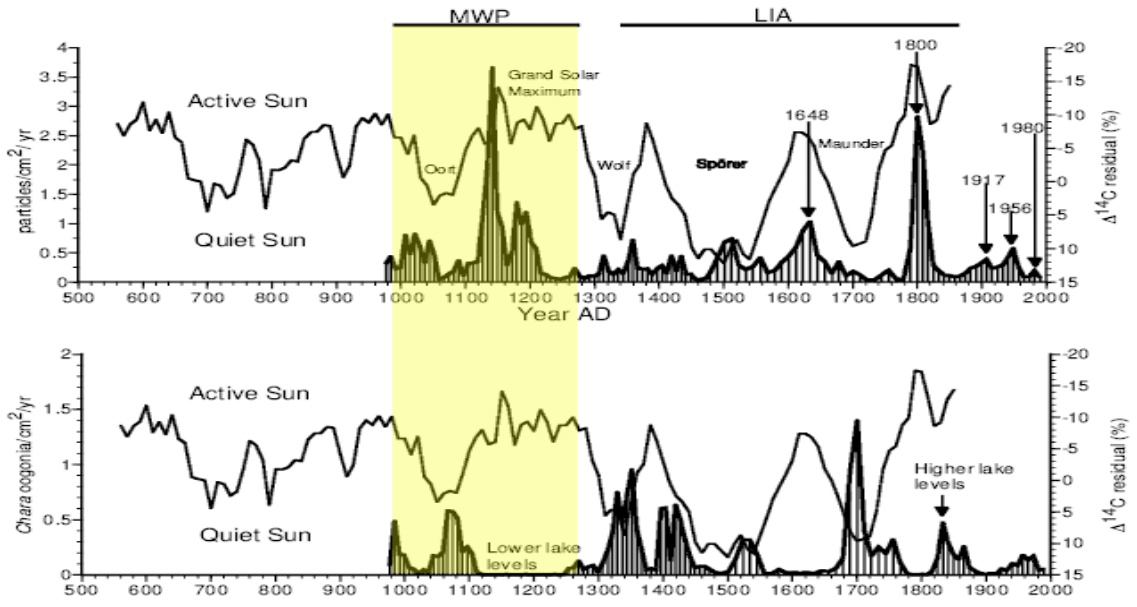
Lower Grindelwald Glacier, Bernese Alps, Switzerland

Holzhauser *et al*. (2005) also present a record of glacial variation for the Lower Grindelwald glacier, in the Bernese Alps, Switzerland (~46.58°N, 8.00°E), as part of an effort to develop a 3500-year climate history of west-central Europe. The Medieval Warm Period was identified in their Figure 2 as a period of significant glacial recession between AD 800 and 1300 –



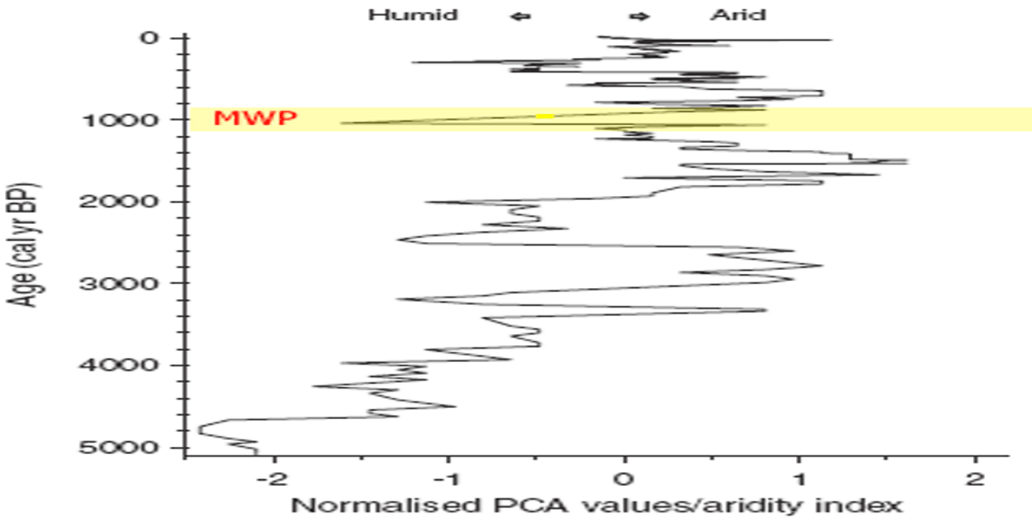
Dog Lake, South-Eastern British Columbia, Canada

Hallett *et al.* (2003) compared the dendrochronological fire history of the forested area surrounding Dog Lake (50.77°N, 116.1°W) with a high-resolution charcoal record derived from a sediment core extracted from the lake to reconstruct the region's fire history over the past 1000 years. In addition, the authors constructed a proxy record of lake-level change based on accumulation rates of *Chara globularis*-type oospores in the lake sediment core. These analyses revealed the presence of frequent forest fires and lowered lake levels during the Medieval Warm Period (AD 980-1270), which in the words of the authors support evidence of "warmer and drier climate than today" –



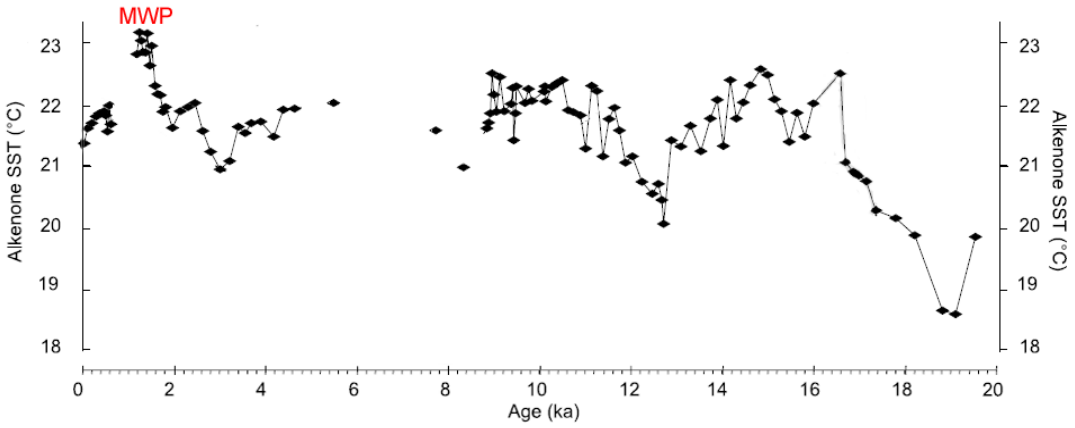
Island of Pico, Azores, Central North Atlantic

Bjorck *et al.* (2006) inferred general climatic conditions from "sedimentology, geochemistry, diatom analyses, magnetic properties, and multivariate statistics, together with ^{14}C and ^{210}Pb dating techniques" applied to a core obtained from the center of a small crater lake on the Azores island of Pico (38°26'N, 28°12'W). The medieval warm period was broadly characterized by the adjoining "cooler/drier periods" of 400-800 and 1300-1800 cal yr BP, but the authors found it most strongly expressed between AD 1000 and 1100 –



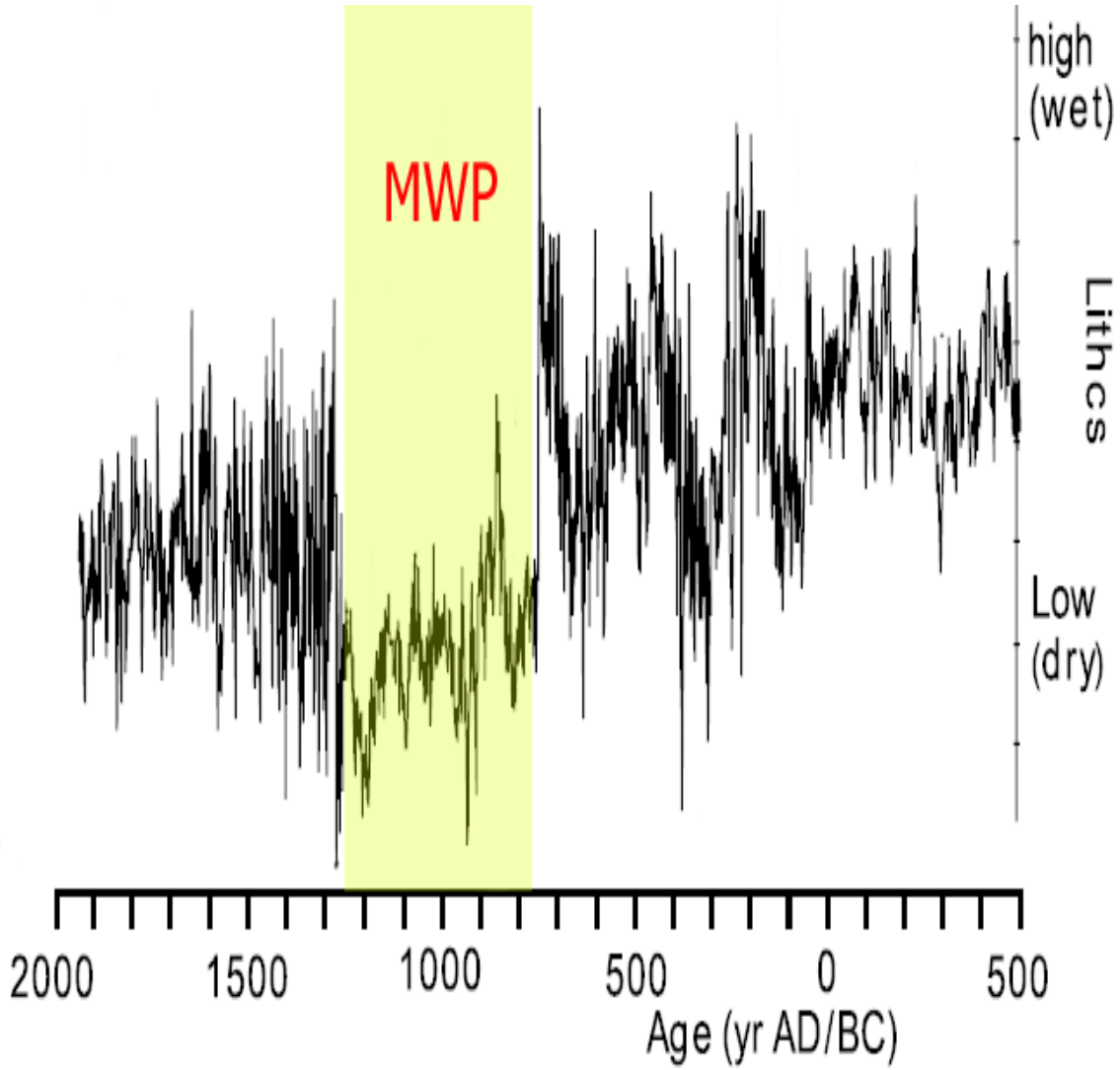
Coastal Peru, South America

Rein *et al.* (2005) derived sea surface temperatures from alkenones extracted from a high-resolution marine sediment core retrieved off the coast of Peru (12.05°S, 77.66°W), spanning the past 20,000 years and ending in the 1960s. From their Figure 11, adapted below, it can be seen that the warmest temperatures of this 20,000 year period (~23.2°C) occurred during the late Medieval time (AD 800-1250). Taking this value, 23.2°C, and comparing it with the *modern* monthly long-term means in sea surface temperature, which the authors characterize as between 15°C and 22°C, we estimate the peak warmth of the Medieval Warm Period was about 1.2°C above the Current Warm Period –



Coastal Peru, South America

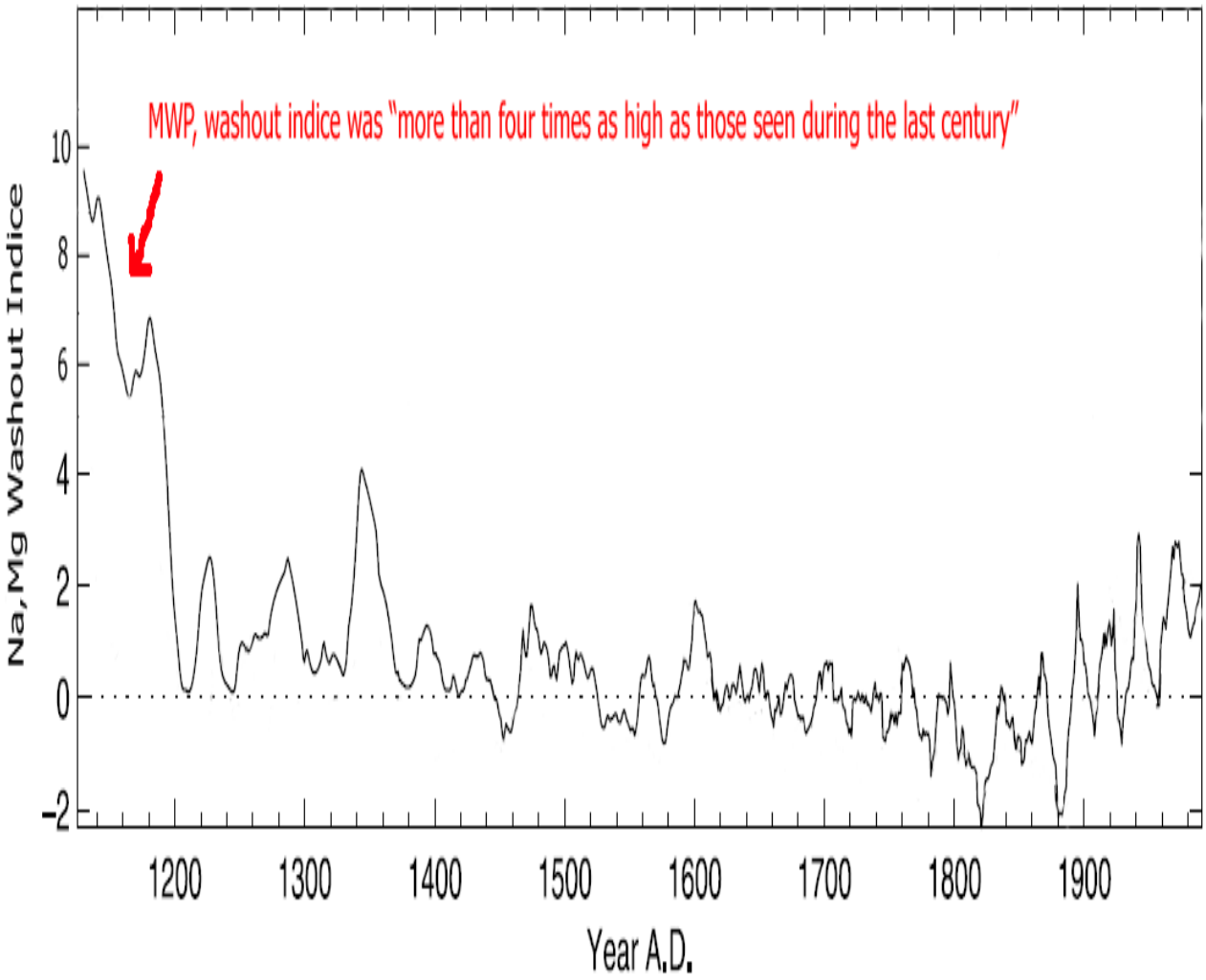
Rein *et al*. (2004) analyzed a high-resolution sediment core retrieved from a sheltered basin situated on the edge of the Peruvian shelf about 80 km west of Lima, Peru (12.05°S, 77.66°W) to produce a proxy record of El Niño flooding over the past 12,000 years. Results indicated the presence of a significant dry episode during the late Medieval period in which lithic concentrations - a proxy for El Niño events - were "very low for about 450 years during the Medieval climatic anomaly from A.D. 800 to 1250." Because heavy winter rainfalls along and off coastal Peru only occur during times of maximum El Niño strength, and because El Niños are typically much more prevalent and stronger during cooler as opposed to warmer periods [see El Niño (Relationship to Global Warming) in our Subject Index], the implied lack of strong El Niños during the period of time from A.D. 800-1250 suggests that this period was truly a Medieval Warm Period.



Marine record of El Niño flood sediments off Peru as derived from lithic concentrations. Adapted from Rein et al. 2004.

Lomonosovfonna Ice Core, Svalbard, Norway

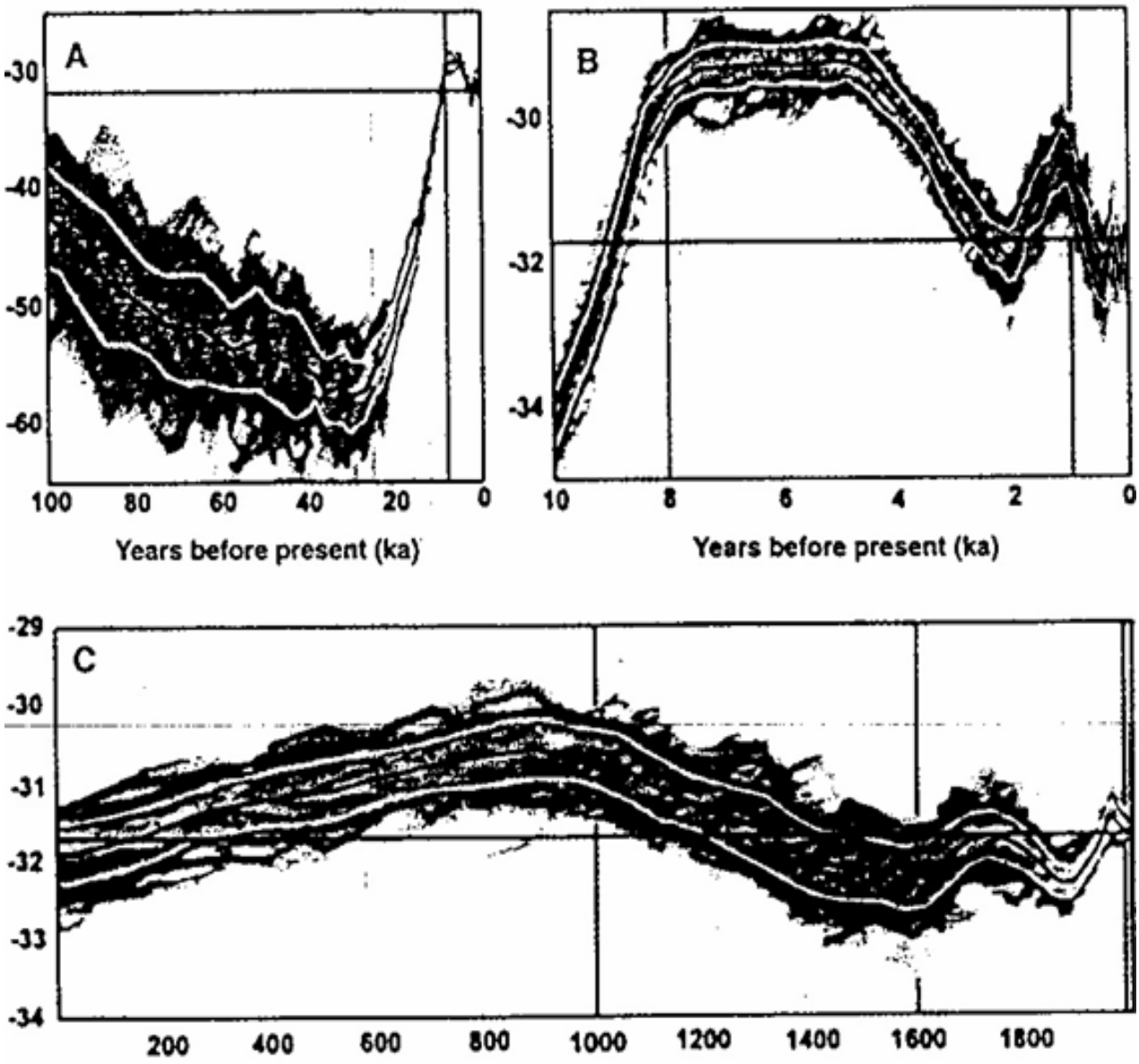
Grinsted *et al.* (2006), from data obtained from a 121-meter-long ice core extracted from the highest ice field in Svalbard (Lomonosovfonna: 78°51'53"N, 17°25'30"E), developed "a model of chemical fractionation in ice based on differing elution rates for pairs of ions ... as a proxy for summer melt (1130-1990)," which was "validated against twentieth-century instrumental records and longer historical climate proxies." This work revealed, in their words, that "the Medieval Warm Period in Svalbard summer conditions [was] as warm (or warmer) as present-day," because "the degree of summer melt was significantly larger during the period 1130-1300 than in the 1990s."



15-year moving average of a washout indice derived from Na and Mg data from a Lomonosovfonna ice core, which data are a proxy for summer ice melt. Adapted from Grinsted et al. 2006

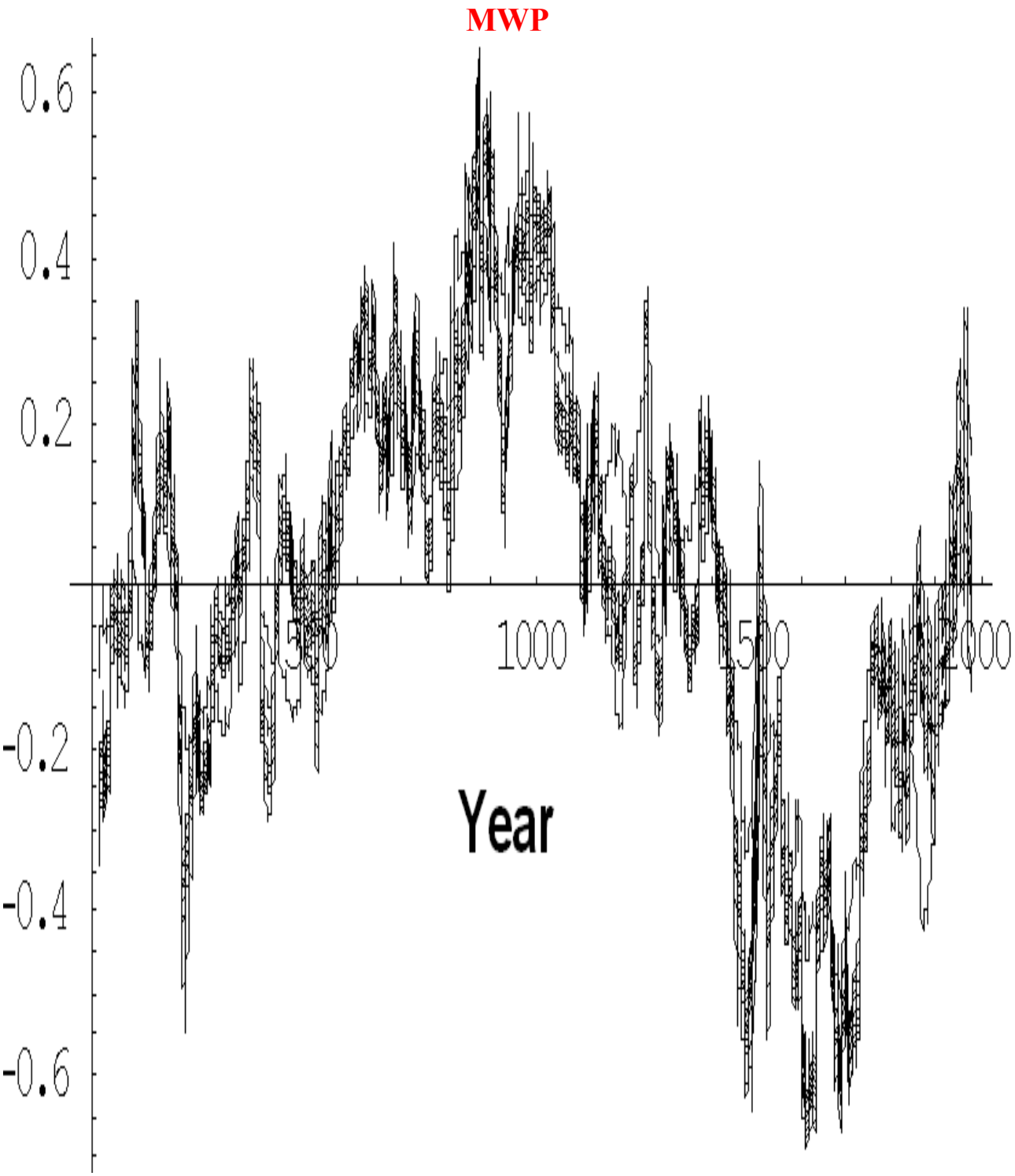
Summit of the Greenland Ice Sheet

Dahl-Jensen compiled contour plots of temperature histograms from the GRIP ice-core as a function of time, describing the reconstructed temperature history and its uncertainty at the present elevation (3240 m) of the summit of the Greenland Ice Sheet. (A) The last 100 ky BP. The last glacial maximum (25 ka BP) is seen to have been 23 degrees K colder than the present temperature, and temperatures are seen to rise directly into the warm climate optimum 8 to 5 ka. (B) The last 10 ky BP. The climate optimum is 2.5 degrees K warmer than the present temperature, and at 5 ka the temperature slowly cools toward the cold temperatures found around 2 ka. (C) The last 2000 years. The medieval warming (~1000 AD) is 1 degree K warmer than the present temperature, and the Little Ice Age is seen to have two minima at 1500 and 1850 A.D., followed by a temperature rise culminating around 1930 A.D. Temperature cools between 1940 and 1995.



Temperatures from proxy data with tree-rings eliminated

Loehle (2007) compiled a global palaeoclimate temperature series from proxy temperature data after eliminating data derived from tree-rings, which are unreliable in that their growth is enhanced not only by temperature increase but also by higher precipitation and by CO2 fertilization. After the distortions caused by the tree-ring data were eliminated, the medieval warm period was shown to have been significantly warmer than the present.



Conclusion

The continuing affair of the "hockey-stick" graph is a microcosm of the profound collapse of the rigor, objectivity, and honesty that were once hallmarks of the scientific community. The need to look to the State for very nearly all science funding has inflicted upon the scientific community a dull, dishonest uniformity, so that the deliberate falsification of results to support the current official orthodoxy has become commonplace, particularly where the climate question is concerned.

It was bad enough that one of those behind the "hockey stick" affair should have told a fellow-researcher, "We need to get rid of the medieval warm period." It was worse that the authors of the bogus graph attempted to do just that, by ignoring, undervaluing or even suppressing proxies for northern-hemisphere temperature that did not suit the result they wanted; by falsely stating that they had used data they had in fact replaced with "estimates" of their own that gave them a less inconvenient answer; by overvaluing by many orders of magnitude the contribution of datasets that suited the result they wanted.

It was worse still that the IPCC, several leading journals and numerous former co-authors of the three fabricators of the hockey stick should have continued to cling to it as though it were Gospel even though it has been justifiably and utterly discredited in the scientific literature, and should have gone through an elaborate pantomime of rewriting and publishing previously-rejected papers with the connivance of a dishonest journal editor, so that an entirely fictitious scientific support for the false graph could be falsely claimed by the IPCC in its current *Fourth Assessment Report.*

The IPCC might have regained some of the scientific credibility that it lost by its publication of the 2001 graph if, in its 2007 assessment report, it had had the integrity, honesty, and common sense to apologise for the failure of its *soi-disant* "peer-review" process to identify the multiple and serious scientific errors that led to the publication of the graph.

As it is, the IPCC, rather than apologizing, has chosen to participate in the falsification of subsequent results purporting to uphold the original graph, and altogether to ignore papers such as those whose graphs are shown here, confirming the well-established historical record of the existence of the medieval warm period. No serious scientist, therefore, can any longer take any of the IPCC's conclusions seriously for a single moment longer. As Lord Lawson of Blaby has long argued, the IPCC should now be abolished. It cannot serve any useful purpose in future, because it has dishonestly lent its support not merely to the falsification of scientific results but to the persistent maintenance of that falsification. The IPCC is finished.

Was there a medieval warm period? Yes. Was that period warmer worldwide than the present? Yes. Are today's global temperatures exceptional? No. Have the past ten thousand years been generally warmer than the present? Yes: much warmer. Is there, therefore, the slightest reason for the childish panic that the environmental extremist movement and its servant the IPCC have attempted to whip up? No. Should any government devote a single further penny to the climate scare? No. Even if humankind is contributing significantly to warmer weather (which is highly unlikely), adaptation to warmer weather as *and if* necessary would be orders of magnitude cheaper than the measures to reduce carbon emissions that the world's extremist politicians are now so eagerly but purposelessly advocating.

The real cost of the flagrant abuses of the scientific method surrounding the question of climate that are so well illustrated by the affair of the "hockey stick" is a terrible, unseen cost in human lives. The

biofuel scam that arose directly out of the climate scare has taken one-third of US agricultural land out of food production in just two years. Similar economic disasters have occurred worldwide, not because of "global warming" but because of the catastrophically bad policy-making that the "global warming" scare has engendered among politicians too ignorant of science and too lazy to do other than swim with the rising tide of pseudo-scientific nonsense.

The environmental extremists, who have already killed 50 million children through malaria by their now-canceled ban on the use of DDT, the only effective agent against the *anopheles* mosquito that spreads the infective parasite, are already eagerly killing millions more through their latest scientifically-baseless scare – the "global warming" panic pandemic. Food riots are occurring throughout the world among the poorest of the poor in many countries: but the desperation, starvation, disease, and death that accompany the sudden famines that the biofuel-driven doubling of world food prices has engendered are scarcely reported by our news media. In Haiti, they are eating mud pies made of earth, water, a tiny knob of butter, and a pinch of salt; or they sell the mud pies to less fortunate neighbours at 3 US cents each. Has any Western news medium reported this, or the hundreds of other agonizing stories of famine and starvation all round the world? No. Instead, every icicle that falls in Greenland is paraded as an omen of imminent doom: and, as for the crooked pseudo-scientists who invented the hockey stick, supported it, and continue to parade it in the mendacious documents of the IPCC, no journalist would dare to ask any of them the questions that would expose their self-seeking corruption for what it is. These evil pseudo-scientists, through the falsity of their statistical manipulations, have already killed far more people through starvation than "global warming" will ever kill. They should now be indicted and should stand trial alongside Radovan Karadzic for nothing less than high crimes against humanity: for, in their callous disregard for the fatal consequences of their corrupt falsification of science, they are no less guilty of genocide than he.

References

BJORCK, S., Rittenour, T., Rosen, P., Franca, Z., Moller, P., Snowball, I., Wastegard, S., Bennike, O. and Kromer, B. **2006.** *A Holocene lacustrine record in the central North Atlantic: proxies for volcanic activity, short-term NAO mode variability, and long-term precipitation changes.* Quaternary Science Reviews **25:** 9-32.

CHU, G., Liu, J., Sun, Q., Lu, H., Gu, Z., Wang, W. and Liu, T. **2002.** *The 'Medieval Warm Period' drought recorded in Lake Huguangyan, tropical South China.* The Holocene **12:** 511-516.
DAHL-JENSEN (1998), *Temperature history of the summit of the Greenland Ice Sheet,* Science 282.

GRINSTED, A., Moore, J.C., Pohjola, V., Martma, T. and Isaksson, E. **2006.** *Svalbard summer melting, continentality, and sea ice extent from the Lomonosovfonna ice core.* Journal of Geophysical Research **111:** 10.1029/2005JD006494.

GUPTA, A.K., Das, M. and Anderson, D.M. **2005.** *Solar influence on the Indian summer monsoon during the Holocene.* Geophysical Research Letters **32:** doi:10.1029/2005GL022685.

HALLETT, D.J., Mathewes, R.W. and Walker, R.C. **2003.** *A 1000-year record of forest fire, drought and lake-level change in southeastern British Columbia, Canada.* The Holocene **13:** 751-761.

HOLZHAUSER, H., Magny, M. and Zumbuhl, H.J. **2005.** Glacier and lake-level variations in west-central Europe over the last 3500 years. *The Holocene* **15**: 789-801.

KHIM, B.-K., Yoon, H.I., Kang, C.Y. and Bahk, J.J. **2002.** *Unstable climate oscillations during the Late Holocene in the Eastern Bransfield Basin, Antarctic Peninsula.* Quaternary Research **58:** 234-245.

MANGINI, A., Spotl, C. and Verdes, P. **2005.** *Reconstruction of temperature in the Central Alps during the past 2000 yr from a $\delta^{18}O$ stalagmite record.* Earth and Planetary Science Letters **235:** 741-751.

NOON, P.E., Leng, M.J. and Jones, V.J. **2003.** *Oxygen-isotope ($\delta^{18}O$) evidence of Holocene hydrological changes at Signy Island, maritime Antarctica.* The Holocene **13:** 251-263.

PLA, S. and Catalan, J. **2005.** *Chrysophyte cysts from lake sediments reveal the submillennial winter/spring climate variability in the northwestern Mediterranean region throughout the Holocene.* Climate Dynamics **24:** 263-278.

QIANG, M., Chen, F., Zhang, J., Gao, S. and Zhou, A. **2005.** *Climatic changes documented by stable isotopes of sedimentary carbonate in Lake Sugan, northeastern Tibetan Plateau of China, since 2,000 years before the present.* Chinese Science Bulletin **50:** 1930-1939.

REIN B., Lückge, A., Reinhardt, L., Sirocko, F., Wolf, A. and Dullo, W.-C. **2005.** *El Niño variability off Peru during the last 20,000 years.* Paleoceanography **20:** 10.1029/2004PA001099.

REIN B., Luckge, A. and Sirocko, F. **2004.** *A major Holocene ENSO anomaly during the Medieval period.* Geophysical Research Letters **31:** 10.1029/2004GL020161.

SEPPA, H. and Birks, H.J.B. **2002.** *Holocene climate reconstructions from the Fennoscandian tree-line area based on pollen data from Toskaljavri.* Quaternary Research **57:** 191-199.

TYSON, P.D., Karlen, W., Holmgren, K. and Heiss, G.A. **2000.** *The Little Ice Age and medieval warming in South Africa.* South African Journal of Science **96:** 121-126.

WILLIAMS, P.W., King, D.N.T., Zhao, J.-X. and Collerson, K.D. **2004.** *Speleothem master chronologies: combined Holocene ^{18}O and ^{13}C records from the North Island of New Zealand and their palaeoenvironmental interpretation.* The Holocene **14:** 194-208.

WILSON, A.T., Hendy, C.H. and Reynolds, C.P. **1979.** *Short-term climate change and New Zealand temperatures during the last millennium.* Nature **279:** 315-317.

SPPI
Science & Public Policy Institute

Robert Ferguson
SPPI President
bferguson@sppinstitute.org

209 Pennsylvania Ave., SE
Suite # 299
Washington, D.C. 20003
202.288.5699

"Science-based policy for a better world."
www.scienceandpublicpolicy.org