

## KlimaNotizen Newsletter 13 - Climate change: The Hockey Stick

### Climate change: The Hockey Stick

#### Dear reader

For years, the 'Hockey Stick' has been one of the most important arguments in public for human induced climate change. It suggests that global warming during the 20th century is most probably caused by mankind.

But now climate scientists are faced with new findings according to which the hockey stick theory is utterly wrong. Obviously this central issue of climate policy has never been scientifically checked by an independent institution. Professor Mann, the father of the hockey stick, refuses to disclose his methods and data.

So this is a topic for this newsletter.  
Further topics are in the pipeline.

...

Additional information, comments, ideas and views are welcome.  
More information at [www.KlimaNotizen.de](http://www.KlimaNotizen.de)

Best regards

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### Climate change: The Hockey Stick

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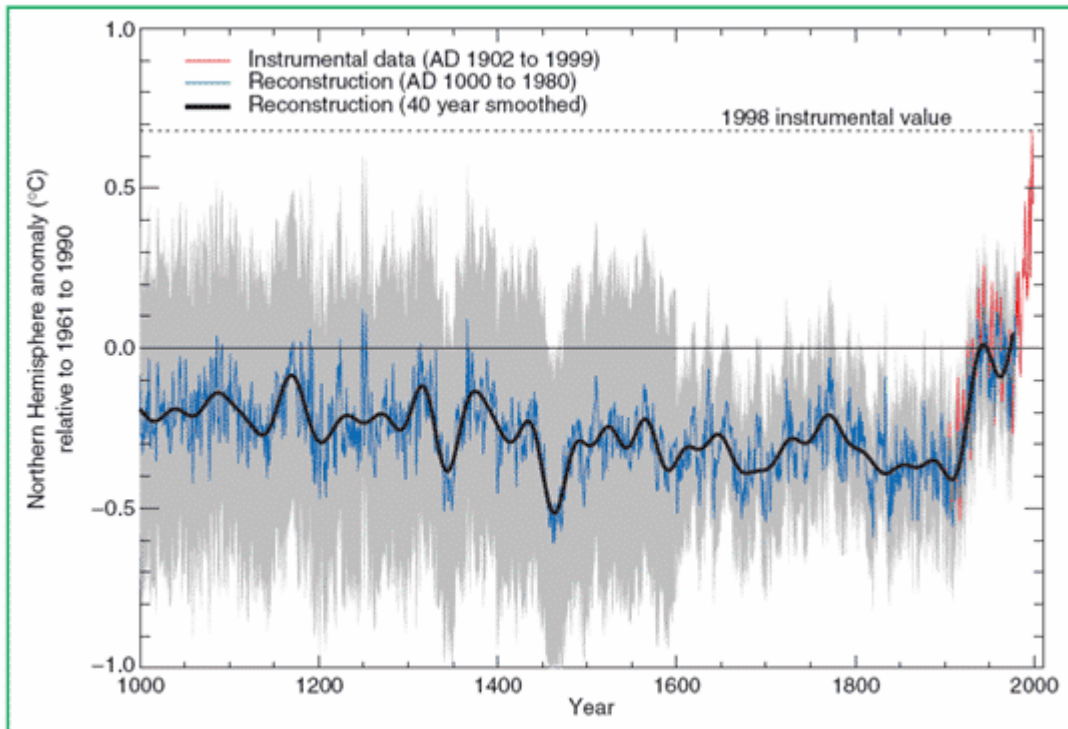
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For years, the 'hockey stick' has been one of the most important arguments in public worldwide for human induced climate change, but important parts of it are incorrect. Until recently, the hockey stick has never been scientifically checked in detail. Here, the credibility of international climate politics is challenged. Is climate research still open-ended? The hockey stick casts doubts on climate models. A correction of the climate models would again give a greater importance to natural influence factors, such as the sun.

The Hockey Stick is a chart showing the temperature curve of the Northern Hemisphere over the past 1000 years. The curve resembles a hockey stick.



(5), The hockey stick according to Mann, M.E., R.S. Bradley and M.K. Hughes (1999) (8)  
 blue, black: reconstructions from tree rings, corals, ice cores etc  
 red: direct measurements from temperature stations as from 1860

The hockey stick was created by the scientist Dr. Mann and colleagues in 1999 and was first officially named and introduced in the IPCC Third Assessment Report 'Climate Change 2001' of the UNO. Since then, this climate curve has worldwide been considered to be the standard – and almost a dogma.

Approximately until 1900, the chart shows relatively stable climate conditions with a tendency to cool off - the handle of the hockey stick.

The temperature rise began around 1900 in parallel to a strong increase in greenhouse gases – the blade of the hockey stick.

Im Klimabericht des IPCC der UNO 2001 heißt es:

**The 2001 IPCC climate assessment report of the UNO states:**

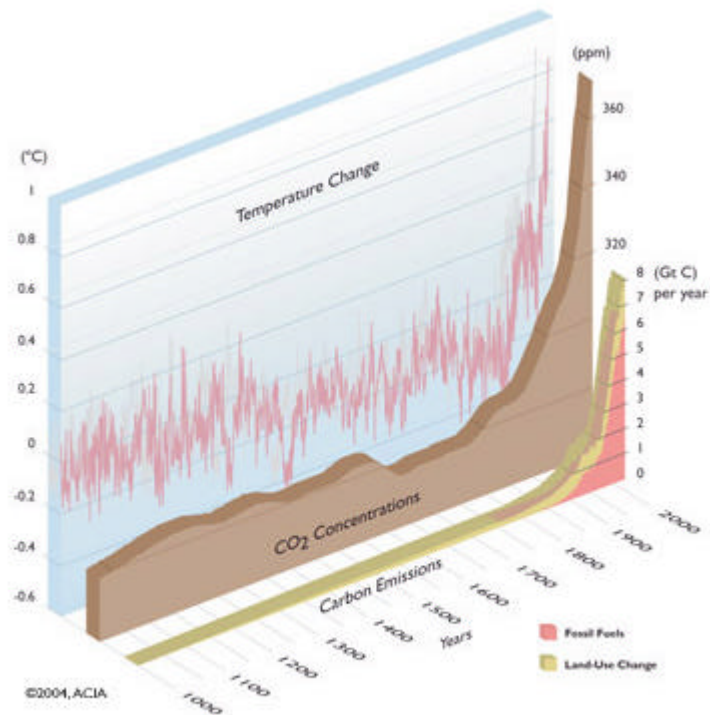
***As Figure 5 indicates, the rate and duration of warming of the Northern Hemisphere in the 20th century appears to have been unprecedented during the millennium, and it cannot simply be considered as a recovery from the "Little Ice Age" of the 15th to 19th centuries.*** (5)

### **The Hockey Stick as a killer argument**

Thousands of publications worldwide have used the hockey stick again and again to persuade their readers of human induced warming.

How the hockey stick is a very effective instrument for PR purposes was recently shown in the report "Arctic Climate Impact Assessment" (ACIA) published in 2004 (3). The function of this report is to support policy makers in making the right decisions for protecting the arctic. It was written for the Arctic Council, an intergovernmental forum of the Arctic states.

The hockey stick is an important argument in the report and is used to prove human induced warming due to greenhouse gases.



(3), The temperature curve of the hockey stick combined with the atmospheric curve of CO<sub>2</sub> concentration. The figure suggests that the sharp temperature rise since 1860 was caused by CO<sub>2</sub>.

### Conclusion:

The hockey stick has a suggestive effect, because the temperature and CO<sub>2</sub> concentration curve of the past 1000 years are almost parallel, and in addition, the CO<sub>2</sub> increase in the 20th century is unanimously put down to mankind.

The lack of a distinct medieval warm period and a distinct short-term ice age clearly supports this theory.

### What is wrong with the hockey stick ?

The criticism for the hockey persisted over the past few years. A number of scientific publications consistently cast doubts on the reconstruction of the temperature data.

These are the most important reviews (McIntyre/McKittrick, Hans von Storch and Ulrich Cubasch).

#### 1. McIntyre/McKittrick (7)

first analyzed the data and methods in detail. This year, the two Canadians published a sensational critical review of the hockey stick in the *Geophysical Letters* of the American Geophysical Union.

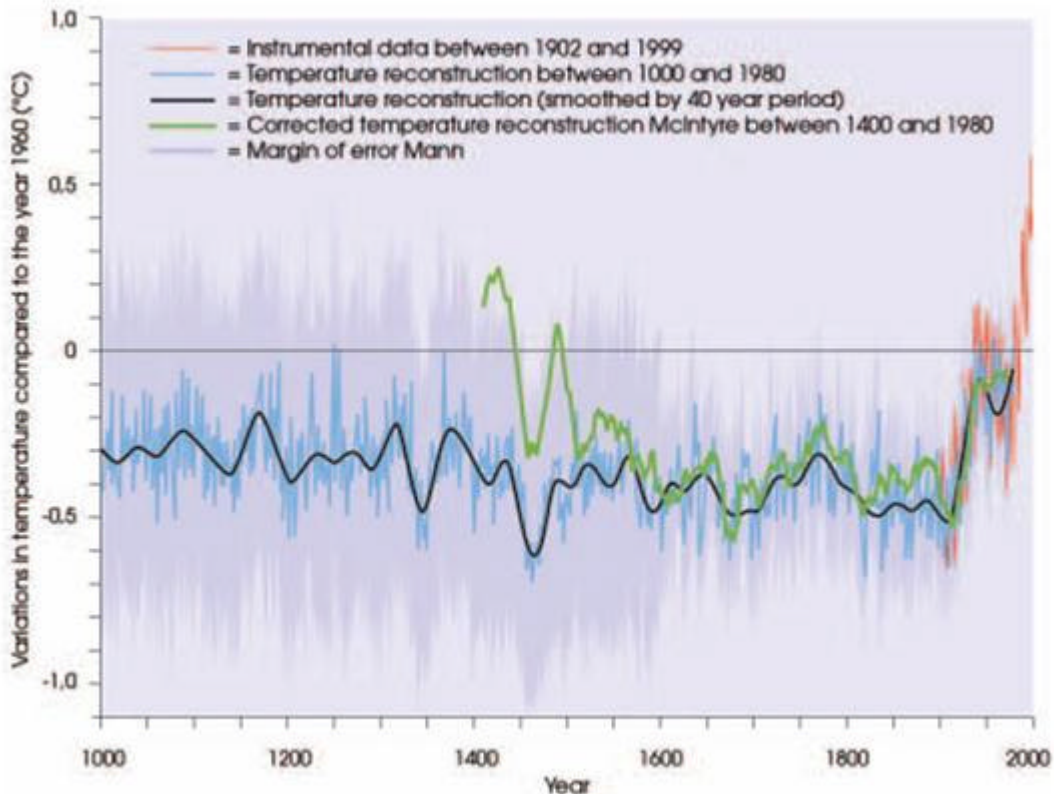
The renowned Dutch science magazine *Natuurwetenschap & Techniek* (6) has now presented the critical assessment of the Canadian authors in a comprehensive and easily understandable article.

The article reads like a detective story and could be mistaken for a didactic play on bad science. (6) The article is available in English.

The two Canadians tried to reconstruct the hockey stick based on the original data. This led to the following results:

The use of the original methods almost always resulted in a hockey stick shape, if for example the tree ring data were entered as red noise series (!).

After the correction of further major errors the surprising result was that temperatures in the 15th century were just as high as they were in the 20th century (1).



(6), the hockey stick and the corrected temperature curve (green line) by McIntyre between 1400 and 1980

(The green curve is not intended to indicate the true temperature, but to show the result of a correct use of the data)

## 2. Hans von Storch

is a well-known and internationally renowned climate researcher.

Storch and colleagues developed a special method to analyze the methods behind the hockey stick. They found that the reconstruction of past climatic variations is incorrect. The variations are suppressed and make the temperature rise of the 20th century seem to be exceptional. (10) The results were published in the Science magazine.

Hans von Storch about the hockey stick: "The curve is nonsense" (9)

## 3. Ulrich Cubasch

Is meteorology professor at the FU Berlin and co-author of the 2007 edition of the IPCC report.

*... My research team works on the curve, too. I had a Ph.D. student reconstruct Mann's work. She found very soon that it is impossible to reproduce his diagram. We worked hard to turn every stone - and to find a lot of worms, that's how science works.*

*The problem with this case is that Michael Mann refuses to disclose his data. And it is a problem, too, that this discussion has become politically delicate....* (6a)

## The Hockey Stick gets ahead

*It is all about one single curve. This curve represents a whole research field: climate research – and its scientific credibility and reputation. An ambitious doctor of meteorology presented this curve to the experts in 1998 and 1999: Michael Mann.*

*Today, only few years later, the professor Michael Mann teaches at the University of Virginia. His publications in the 'Nature' magazine and the 'Geophysical Research Letters' hit like a bomb. The average number of quotations of his article in 'Nature' article was twice as high as usual: unmistakable evidence for the popularity of the paper. Like no other publication before, Mann's article delivered exactly the information that had been missing until then, and like no other curve it illustrated what climate researches were longing for: the dramatic temperature rise in the earth's atmosphere during the past 150 years....*

*It is thus hardly surprising that the editors of the most important transnational research consortium for climate change IPCC, the Intergovernmental Panel on Climate Change, placed this curve on page 3 –*

of the summary for politicians...

For the United Nations and the national governments this curve served well to promote the Kyoto Protocol. Meanwhile Michael Mann had become an undisputed expert in climate research. Articles and manuscripts hence required his approval before publication.

In 2002, the Scientific American ranked him among the top 50 visionaries in science. (14)

However, professor Mann keeps on defending his hockey stick. (15)

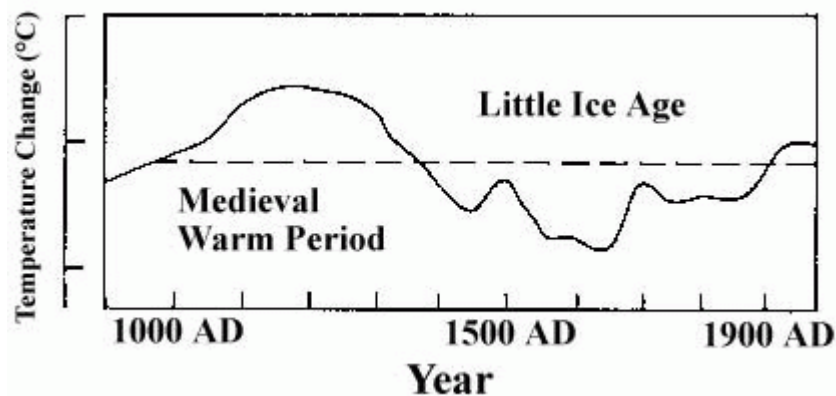
He is not willing to disclose all of his documents (data+software+descriptions).

In the Wall Street Journal he refused to publish the source code of his analysis software. (!)

Until recently, obviously nobody in the science community had bothered to scientifically check the hockey stick in detail. (!)

### Is there a „true“ temperature curve for the last 1000 years?

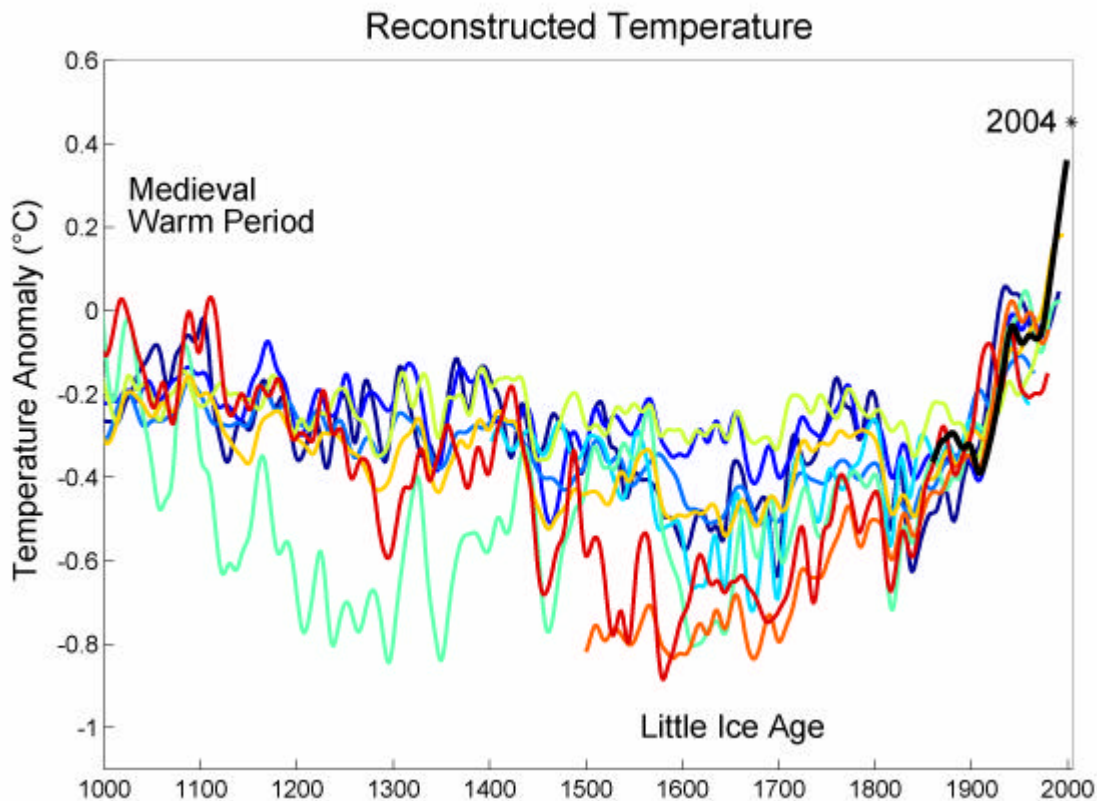
In the 1990 report the IPCC (2) still illustrated the temperature curve of the past 1000 years as displayed in this diagram.



(2)

This temperature curve between 950 and 1950 shows a very warm period in the middle age that almost matches or surpasses today's curve (in the years after 1950). Here, the temperature rise since 1860 is neither exceptional nor unexpected. This curve can hardly be used to warn of human induced greenhouse effects.

From the scientific point of view the temperature reconstruction of the past 1000 years is far from being completed. The figure below, the so-called "spaghetti curve" (13), shows a comparison of most of today's reconstruction attempts.



(13) These ten temperature reconstruction curves for the past 1000 years are currently under discussion in climate research.

The spaghetti curve demonstrates that:

- The Middle Ages were warm, the 16th and 17th century were cold and the 20th century again was warm.
- The differences between the curves are quite large.
- The results delivered by measurement stations established in 1860 (black curve) and those of most reconstructions (tree rings, corals etc.) clearly differ when it comes to the 20th century

The results from measurement stations established in 1860 (black curve) show a sharp rise in the 20th century. It is remarkable that the reconstructions (tree rings, corals etc.) only go back until 1980 and indicate a warming as in the Middle Ages.

A closer look shall be taken at this in the following, with a big surprise.

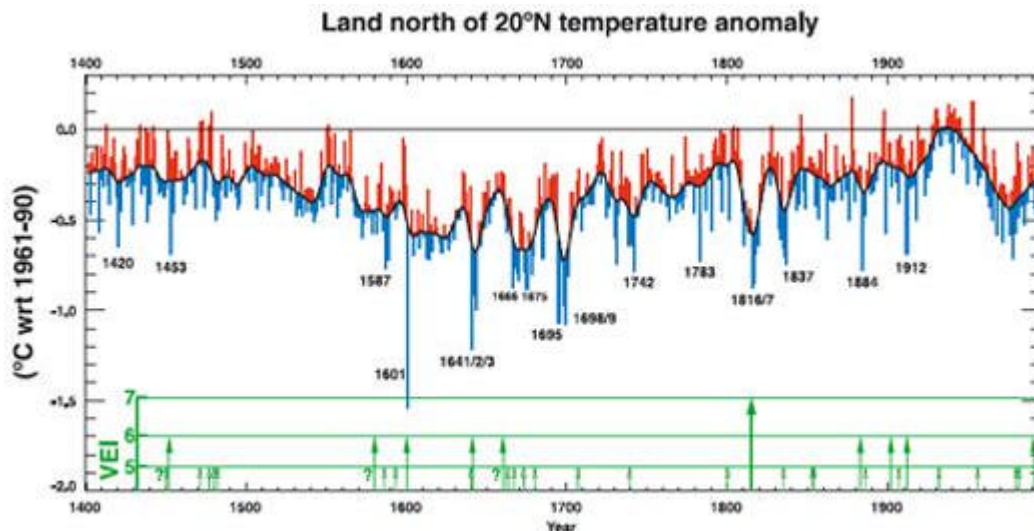
#### **Tree rings show only minor warming during the last decades**

It is remarkable that almost every reconstruction based on tree rings only goes back until 1980. So what has happened during the last 25 years? What can we learn from the tree rings from the two past decades?

The renowned scientist K.R. Briffaa and colleagues made an attempt to analyze tree rings until the year 2000 (2).

The following diagram shows the results of their study.





(12)

The results are amazing:

The temperature rise in the second half of the 20th century that had been quoted time and again does not show in the tree rings!

The authors of the study say that the tree rings do not correspond with the warming in the 20th century. Possibly other factors than the summer temperatures have had an impact on tree ring growth since 1950. In addition, the authors imply that the tree rings give no reason to assume that the warming in the 20th century is unexpected. Further research is necessary.

That raises further questions:

If we assume that tree rings do not properly reflect the last decades, can they give us reliable information about the temperatures in the past millennium at all?

But maybe the data obtained from the tree rings are not completely wrong. Measurements taken by satellites and hot-air balloons only show little warming for the past decades, too ([Newsletter 3](#)). The exact data obtained from ice cores in Greenland tend to confirm this ([Newsletter 11](#)).

Conclusion:

**Today, after decades of time and money consuming research in the field of climate change, there is still no recognized and scientifically proven temperature reconstruction of the past 1000 years.**

### **Is the correct reconstruction of temperatures of the past that important?**

In the article "What if ... the hockey stick were wrong?" (16) Professor Rahmstorf writes:

*The discussions about the past millennium are not discussions about whether humans are changing the climate in this century by 2 to 3 °C or more. The current discussions over whether the 14th Century was a few tenths of a degree warmer or the 17th a few tenths cooler than previously thought will look rather academic.*

In other words: the human influence on climate is so well-known that they can be determined as plus 2 to 3 °C in the 21st century.

However, the German Federal Agency "Bundesanstalt für Geowissenschaften und Rohstoffe" (BGR) states:

*It is difficult if not impossible to distinguish natural climate development from human induced climate variations. The natural climate system can only be understood if one looks back at those periods of the past when humans were not or only very little active. A realistic assessment of climate development in the future must take both reconstructions from the climatic past and modern climate analyses into consideration...*

*Concerning the correlation between temperature variations and the amount of CO<sub>2</sub> in the atmosphere,*

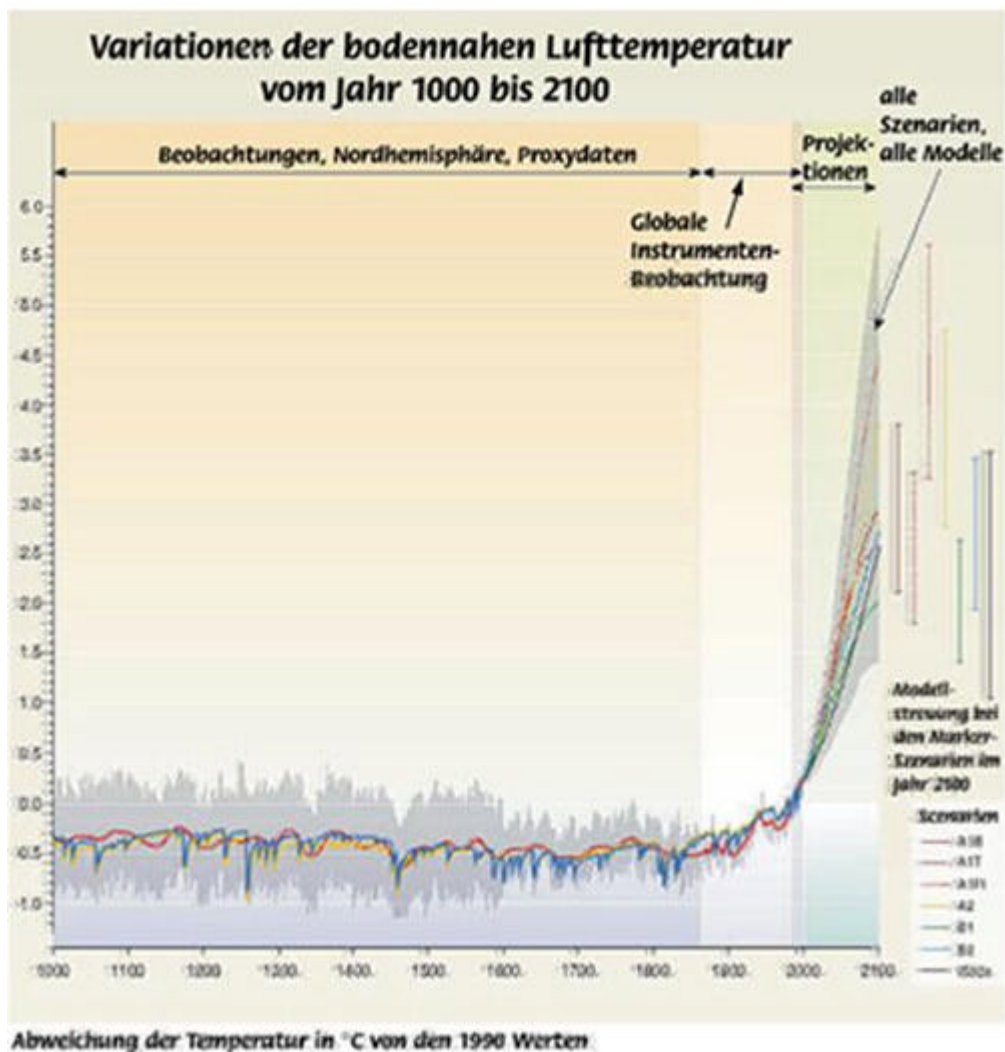
...the knowledge gaps are still much too large for a reliable assessment of the climatic development in the future. (18)

### Do the climate models have to be re-written?

Only who understands the past can foretell the future.

The hockey stick was used to simulate the climate both of the past and of the future.

## Die Temperaturentwicklung der letzten 1000 Jahre und die Projektion für die nächsten 100 Jahre



(4) This computer simulation is based on the hockey stick as the true temperature curve of the past 1000 years.

This computer simulation was done by the Max-Planck-Institute for Meteorology in Hamburg, Germany. The simulation illustrates how the hockey stick was used to equalize the influence of natural factors. (4) Natural factors are the sun, volcanism, inner variability of the climate system etc. The related article by professor Cubasch titled „Variability of the sun and climate variations“ tries to prove the little influence of the sun using the successful simulation by means of the hockey stick. *Between the year 1000 and 1860 only the Northern Hemisphere was averaged, data of the Southern Hemisphere are not available. The data from this period were obtained from tree rings, corals, ice cores and historical traditions...*

*.... but sun activity and volcanism, both based upon proxy data, are prescribed drivers. This model enables a simulation of the global temperature development (figure 4).*

Because the hockey stick is wrong, the results of this simulation must be wrong, too.



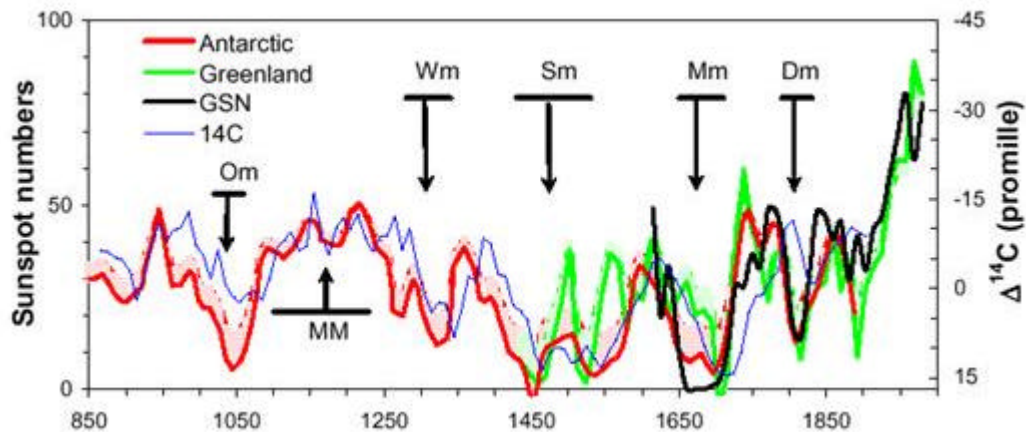
The influence of the sun in this simulation is too low, and thus the forecast for the 21st century seems to be wrong, too.

The article describes how politically explosive a dominant influence of the sun would be:

*This, at first sight innocent, scientific dispute has tangible political consequences: if the IPCC were right, proper measures to reduce the human influence on climate must be taken. But if the supporters of the solar hypothesis were right, mankind would not have to do anything.*

### The sun and the hockey stick

An important argument for the human influence in the 20th century is the supposed low impact of the sun. But if the sun's impact on climate during the past millennium was much higher than indicated in the hockey stick, the human impact of today must be considerably lower.



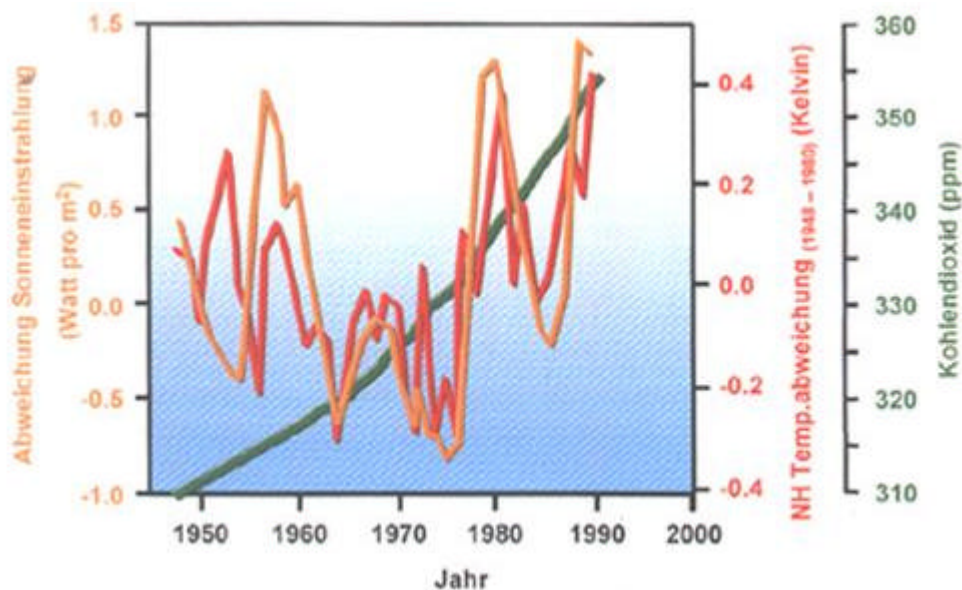
(19) The variations in sun activity reflect temperature events:

Dalton minimum (Dm), Maunder minimum (Mm), Spörer minimum (Sm), Wolf minimum (Wm), Oort minimum (Om), and Medieval Maximum (MM).

Surprisingly the solar radiation curve in the 20th century resembles a hockey stick. At least the temperature rise between 1900 and 1940 and the subsequent variation until 1980 are clearly visible in the sun's radiation curve.

Today, we have the highest sun activity for 8000 years. (!)

Looking at the past decades there is good reason to assume a strong correlation between sun activity and temperature.



(18) Sun's radiation (orange), temperature (red) and CO2 (green)

*While the sun's energy approximately correlates with the temperature variations (based upon the reevaluation of the temperatures in the Northern hemisphere), the rise of atmospheric CO2 concentrations is not clearly reflected in the temperature curve. (18)*

### **Is politicized climate research still open-ended?**

Is it possible that research results are less thoroughly checked if they confirm accepted concepts? Even if other studies state the contrary? Ulrich Cubasch:

*After all, Mann's work was published by the renowned scientific magazine „Nature“. In this case the IPCC must rely upon the experts from „Nature“. (6a)*

One of the most important principles of science is traceability. How can it be that the data and methods behind the hockey stick can be kept secret by the authors?

Is there a „herd instinct“ in climate research?

Hans von Storch:

*... but what annoys him even more is his colleagues warning him not to touch the 'sacred cow'. "They are telling me: You cannot say that, it would be abused immediately. Some people out there have become paranoid, they expect climate skeptics everywhere." Storch assumes a sort of self-censorship in many colleagues. "This way of researching pre-filters its results and thus deprives the public of the right of decision. This means a crisis in politically relevant research, because it no longer makes a difference between those who do politics and those who advise politicians and provide activity options." (11)*

Karin Labitzke:

*The supporters of the sun theory complain about the predominant CO2 fraction prohibiting free thoughts here. "The impact of the sun is a taboo issue", complains stratosphere expert Karin Labitzke of the Free University of Berlin. "Once we talk about it, people accuse us of being against energy conservation, too." (22)*

Hansjoerg Streif, State Office of Ground Research in Hannover, Germany:

*The Secretary of the Environment in Lower Saxony objected to the publication of the book "Klimafakten"! "... The Secretary reckoned that an institution which is funded by the Ministry of Economics must not deliver results that contradict the political opinion. ... These charges have long since been abandoned. We are free to give our scientific opinion, even if it is not identical with the political opinion. There is no gag order." (24)*

*„Stephan Schneider ... teaches at Stanford University...“ and is the author of several IPCC chapters. „. to get the public's attention we have to draw up shocking scenarios using simple and dramatic statements. Possible doubts should only marginally be considered. Everyone needs to find the right balance between honesty and effectivity.“ (23)*

Climate politics keeps on referring to scientific consensus.

*.... Because a great part of the climate researchers are far from being convinced that the fundamentals were sufficiently examined. A survey among climate researchers in 2004 revealed that 20 percent of the respondents had their doubts about mankind being the source of the latest climate changes. (21)*

12 March 2005

Klaus Oellerer

last update: 16 March 2005

Translation: Silke Kamprich

Last modifications: 11 April 2005

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**References**

1. SCIENCE VOL 295 22 MARCH 2002

Low-Frequency Signals in Long Tree-Ring Chronologies for Reconstructing Past Temperature Variability

Jan Esper, Edward R. Cook, Fritz H. Schweingruber

2. J T Houghton, G J Jenkins, J J Ephraums, Eds., "Climate Change; The IPCC Scientific Assessment". 1990 . Cambridge University Press, p.202

3. Arktische Konferenz - Arctic Climate Impact Assessment (ACIA)

[Impacts of a Warming Arctic: Arctic Climate Impact Assessment](#)

ACIA, Impacts of a Warming Arctic: Arctic Climate Impact Assessment. Cambridge University Press, 2004, <http://www.acia.uaf.edu>

4. Hamburger Bildungsserver: Variabilität der Sonne und Klimaschwankungen

Ulrich Cubasch, Gruppe „Modelle und Daten“ am Max-Planck-Institut für Meteorologie, Hamburg

<http://www.hamburger-bildungsserver.de/welcome.phtml?unten=/klima/solar/>

erschieden in: MaxPlanck Forschung. Das Wissenschaftsmagazin der Max-Planck-Gesellschaft, 4/2001, 78-83

*Eine ... Arbeit präsentiert eine Berechnung des Klimas der letzten 1000 Jahre mit einem eindimensionalen Klima-Modell, wobei die Sonnenaktivität und der Vulkanismus, beide aus Proxy-Daten hergeleitet, als Antrieb vorgeschrieben werden. Mit diesem Modell ist man der Lage, die globale Temperaturentwicklung zu simulieren (Abb. 4).*

5. IPCC 2001

<http://www.ipcc.ch/pub/wg1TARtechsum.pdf>

*“As Figure 5 indicates, the rate and duration of warming of the Northern Hemisphere in the 20th century appears to have been unprecedented during the millennium, and it cannot simply be considered as a recovery from the “Little Ice Age” of the 15th to 19th centuries.” (S. 28)*

6. [Naturwissenschaft & Technik](#)

Kyoto based flawed

[http://www.uoguelph.ca/~rmckitri/research/Climate\\_L.pdf](http://www.uoguelph.ca/~rmckitri/research/Climate_L.pdf)

6.a Risse im Klima-Konsens

<http://www.heise-medien.de/presseinfo/bilder/tr/05/tr0503038.pdf>

Prof. Cubasch :

*... Die derzeitige Debatte über das Diagramm von Michael Mann ist in meinen Augen eigentlich Ausdruck einer gesunden wissenschaftlichen Diskussion. Wer die Kurve in Frage stellt, muss absolut keine Klimaskeptiker sein. Auch meine Forschergruppe arbeitet an der Kurve. Ich hatte eine Doktorandin darauf angesetzt, Manns Arbeit nachzuvollziehen.*

*Sie kam recht bald zu dem Schluss, dass sie sein Diagramm nicht reproduzieren kann. Wir haben uns bemüht, die Steine umzudrehen – und prompt jede Menge Würmer gefunden, so funktioniert Wissenschaft nun einmal.*

*Problematisch an diesem Fall ist meiner Ansicht nach nur, dass Michael Mann seine Daten nicht offen legt. Und problematisch ist auch, dass die Diskussion politisch so brisant ist. ...*

*Die Arbeit von Mann war schließlich in „Nature“ erschienen, einem renommierten Fachjournal mit Gutachtern. In solchen Fällen müssen sich die IPCC-Mitarbeiter auf den Begutachtungsprozess verlassen.*

*Jede Publikation im IPCC-Bericht noch einmal nachzurechnen, würde viel zu lange dauern. Es gibt mittlerweile ein ganzes EU-Projekt namens „Soap“, das sich mit der Problematik der Mann-Kurve befasst.*

*Klimaexperten aus sieben Instituten arbeiten dort gemeinsam an Temperaturkurven für die letzten 1000 Jahre.*

*Das Projekt ist mit knapp 1,4 Millionen Euro ausgestattet und auf drei Jahre angelegt – das sind die Zeiträume, die man benötigt, um die Mann-Kurve verlässlich zu überprüfen.*

7. Critique of the Mann et al Northern Hemisphere Average Temperature Reconstruction

<http://www.uoguelph.ca/~rmckitri/research/trc.html>

8. Mann, M.E., R.S. Bradley and M.K. Hughes (1999), Northern Hemisphere temperatures during the past millennium: Inferences, Uncertainties, and Limitations, Geophys. Res. Let., 26, 759-762.

9. Klimaforscher Hans von Storch: “Die Kurve ist Quatsch”

Spiegel 41-2004 Seite 158

[http://hallolinden-db.de/baseportal?htx=/hallolinden-db.de/Klima/Klima&cmd=list&range=0,2500&Datum==\\*&cmd=all&Id=163](http://hallolinden-db.de/baseportal?htx=/hallolinden-db.de/Klima/Klima&cmd=list&range=0,2500&Datum==*&cmd=all&Id=163)

10. Geringerer Einfluss des Menschen

Weltklima: Die natürlichen Schwankungen sind deutlich stärker, als bislang gedacht

[www.welt.de/data/2005/02/10/461144.html](http://www.welt.de/data/2005/02/10/461144.html)

11. FAZ v. 10.12.2004: Die verfluchte Klimakurve

<http://www.faz.net/s/Rub2542FB5D98194DA3A1F14B5B01EDB3FB/Doc~E3077B978C91C42909DAC23A1764C8034~ ATpl-Ecommon~Spezial.html>

12. [www.sciencedirect.com](http://www.sciencedirect.com)

[Large-scale temperature inferences from tree rings: a review](#)

[K.R. Briffaa, T.J. Osborna, F.H. Schweingruber](#)

*However, in many tree-ring chronologies, we do not observe the expected rate of ring density increases that would be compatible with observed late 20th century warming. This changing climate sensitivity may be the result of other environmental factors that have, since the 1950s, increasingly acted to reduce tree-ring density below the level expected on the basis of summer temperature changes. This prevents us from claiming unprecedented hemispheric warming during recent decades on the basis of these tree-ring density data alone. Here we show very preliminary results of an investigation of the links between recent changes in MXD and ozone (the latter assumed to be associated with the incidence of UV radiation at the ground).*

13. [Wikipedia](#)

[Image:1000 Year Temperature Comparison.png](#)

The reconstructions used, in order from oldest (bluest) to youngest (reddest) are:

**(dark blue):** P.D. Jones, K.R. Briffa, T.P. Barnett, and S.F.B. Tett, 1998, "High-resolution Palaeoclimatic Records for the last Millennium: Interpretation, Integration and Comparison with General Circulation Model Control-run Temperatures", *The Holocene* 8, 1998, 455-471.

**(blue):** Michael E. Mann, Raymond S. Bradley, and Malcolm K. Hughes, 1999, Northern Hemisphere Temperatures During the Past Millennium: Inferences, Uncertainties, and Limitations, *Geophysical Research Letters* Vol. 26, No. 6, p. 759, March 15, 1999.

**(light blue):** Crowley and Lowery 2000 (*Ambio* 29, 51), "Northern Hemisphere Temperature Reconstruction", Modified as published in Crowley 2000 (*Science* v289 p.270, 14 July 2000).

(lightest blue, somewhat green): Briffa et al. (2001) *J Geophys Res* 106, 2929-2941.

**(light green):** Esper, J., E.R. Cook, and F.H. Schweingruber, 2002, Low-Frequency Signals in Long Tree-Ring Chronologies for Reconstructing Past Temperature Variability, *Science*, Volume 295, Number 5563, 22 March 2002.

**(yellow):** Mann, M.E. and P.D. Jones, 2003, Global Surface Temperatures over the Past Two Millennia, *Geophysical Research Letters*, Vol. 30, No. 15, 1820, August 2003. doi: 10.1029/2003GL017814.

**(orange):** Jones, P.D. and M.E. Mann. 2004. Climate Over Past Millennia. *Reviews of Geophysics* 42, RG2002, 6 May 2004.

**(red-orange):** Huang, S.. 2004. Merging Information from Different Resources for New Insights into Climate Change in the Past and Future. *Geophys. Res. Lett.* 31, L13205, doi:10.1029/2004GL019781.

**(red):** Moberg, Anders et al., 2005, Highly variable Northern Hemisphere temperatures reconstructed from low- and high-resolution proxy data. *Nature* 443, 613-617.

**(black):** Instrumental data was jointly compiled by the Climate Research Unit and the UK Meteorological Office Hadley Center. Global Annual Average data set TaveGL2v [2] (<http://www.cru.uea.ac.uk/cru/data/temperature/>) was used.

Documentation for the most recent update of the CRU/Hadley instrumental data set appears in: Jones, P.D. and Moberg, A., 2003: "Hemispheric and large-scale surface air temperature variations: An extensive revision and an update to 2001". *Journal of Climate*, 16, 206-223.

14. DasErste.de v. 16.02.2005

[Kyoto-Protokoll: Der Streit um eine Kurve](#)

15. [www.realclimate.org](http://www.realclimate.org)

16. [Prof. Rahmstorff](#) am 27.01.2005:

[What If ... the "Hockey Stick" Were Wrong?](#)

17. The Wall Street Journal, 18 February 2005

*This should have produced a healthy scientific debate. Instead, Mr. Mann tried to shut down debate by refusing to disclose the mathematical algorithm by which he arrived at his conclusions. All the same, Mr. Mann was forced to publish a retraction of some of his initial data, and doubts about his statistical methods have since grown.*

18. **Klimafakten**

Der Rückblick - Ein Schlüssel für die Zukunft

ISBN 3-510-95872-1

19. New Scientist v. 02.11.2003: [Sun more active than for a millennium](#)

[http://arxiv.org/PS\\_cache/astro-ph/pdf/0310/0310823.pdf](http://arxiv.org/PS_cache/astro-ph/pdf/0310/0310823.pdf)

20. Klima inszenierter Angst

Von Hans von Storch und Nico Stehr

[www.spiegel.de/spiegel/0,1518,338080,00.html](http://www.spiegel.de/spiegel/0,1518,338080,00.html)

Spiegel v. 24.01.2004

in english:

[http://sciencepolicy.colorado.edu/prometheus/archives/climate\\_change/000343a\\_climate\\_of\\_staged\\_.html](http://sciencepolicy.colorado.edu/prometheus/archives/climate_change/000343a_climate_of_staged_.html)

21 Hans von Storch: Vortrag Gummersbach, 20.02.2005

[http://w3g.gkss.de/staff/storch/pdf/gummersbach\\_050219.pdf](http://w3g.gkss.de/staff/storch/pdf/gummersbach_050219.pdf)

Umfrage: Der Klimawandel: Sichtweisen und Interpretationen  
<http://w3g.gkss.de/G/Mitarbeiter/storch/THYSEN/HTML/D/d.htm>

22. Spiegel 23/2001: "Klima. Die Launen der Sonne"

23. The Economist 2-2-02 highly critical [editorial](#):

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Stephen Schneider, one of Scientific American's anti-[Lomborgians](#), spoke we suspect not just for himself when he told Discover in 1989: "[We] are not just scientists but human beings as well. And like most people we'd like to see the world a better place...To do that we need to get some broad-based support, to capture the public's imagination. That, of course, entails getting loads of media coverage. So we have to offer up scary scenarios, make simplified, dramatic statements, and make little mention of any doubts we might have...Each of us has to decide what the right balance is between being effective and being honest."

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24. Uwe Schulte  
Streit um Heiße Luft  
Die Kohlendioxid Debatte  
ISBN 3-510-95913-2  
S. Hirzel Verlag Stuttgart - Leipzig 2003