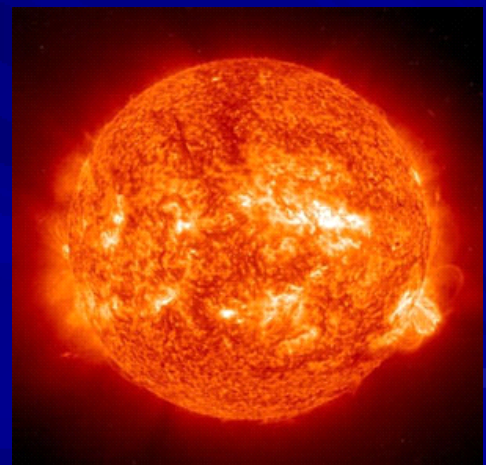


Pseudoscientific elements in climate change research

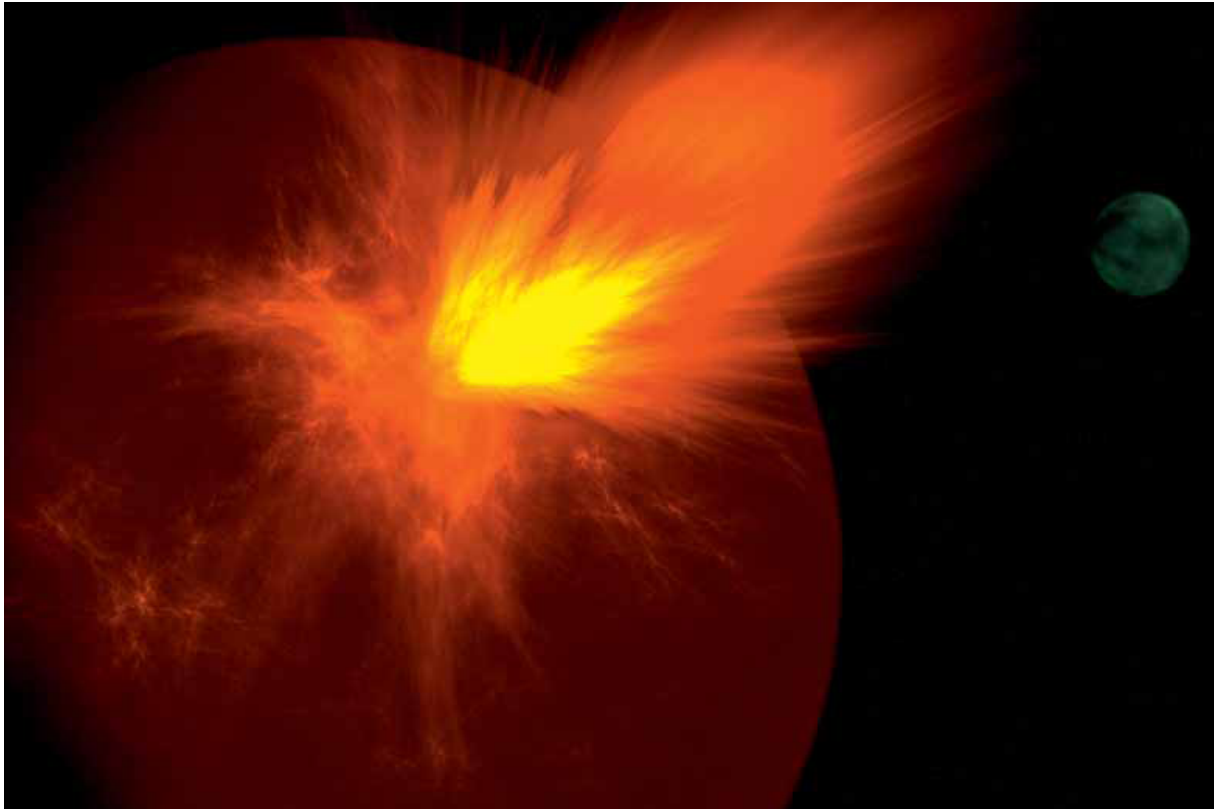
by

Arthur Rörsch

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Dr. Rorsch is not affiliated with SPPI

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¹<http://www.platteland-in-perspectief.nl/>

Table of Contents

| | |
|--|----|
| Abstract | 4 |
| Introduction | 5 |
| Climate change controversies and uncertainties | 7 |
| Consensus? | 9 |
| The Sceptics' viewpoints | 10 |
| The image of science | 11 |
| Pseudoscience | 12 |
| Ringling "alarm bells" | 13 |
| Principles of scientific decision making | 15 |
| Modelling in climatology | 15 |
| The progress of science | 17 |
| The Inheritance of Multatuli | 21 |
| Acknowledgment | 22 |
| Bio | 22 |

Pseudoscientific elements in climate change research

Arthur Rörsch²

Abstract

Alarming statements from the UN Intergovernmental Panel on Climate Change (IPCC) concerning global warming are being challenged by a considerable number of scientists from different disciplines with a variety of arguments. The disputes comprise the collection and interpretation of data, the validation of hypotheses and climate models, the use of those models for scientific decision making, and the quality of the scientific discourse on these matters.

Many of the critical scientists are not directly involved in climate research. This brings into focus the weight to be given to views of experts relative to that of non-experts when the use of the scientific method is discussed in general, and a critique on the use of the peer review system in scientific journals that is supposed to safeguard the quality of science.

The concern of some climatologists and scientists from other disciplines is that the supposed dangerous warming seems to be exaggerated.

The possible causes of exaggerated conclusions are investigated. It is concluded that the general practice of parameterization of computer models in climate change research shows an element of pseudo science because it leads to self-confirmation of input hypotheses (dogmas) and insufficient challenge of theories.

The theory of the enhanced greenhouse effect of increasing CO₂ concentrations in the atmosphere – the very basis for alarming messages concerning future climate change – is itself largely a modelling concept. It is suggested, that for the sake of the progress of science, this theory requires reinvestigation.

² The author is emeritus professor Molecular Genetics, Leiden University (1967-1997) and former member of the board of management of the Netherlands Organization for Applied Research, TNO (1980-1995)

1. Introduction

On 13 December 2007 an open letter was addressed to the Secretary-General of the UN by 100 scientists, engineers, and professionals in the social sciences (see Box 1). It said the danger of dramatic climate change is being exaggerated in the reports from the UN Intergovernmental Panel of Climate Change (IPCC). (See box 1.)

At the time there was a large group of scientists who were convinced that the mean global temperature rise, observed during the 20th century, would accelerate in the 21st century as a result of the observed rise of the concentration of CO₂ in the atmosphere. What made them so sure of their case?

Observations by satellites, which have been measuring mean global temperature of the lower troposphere since 1979, did not seem to support their case.

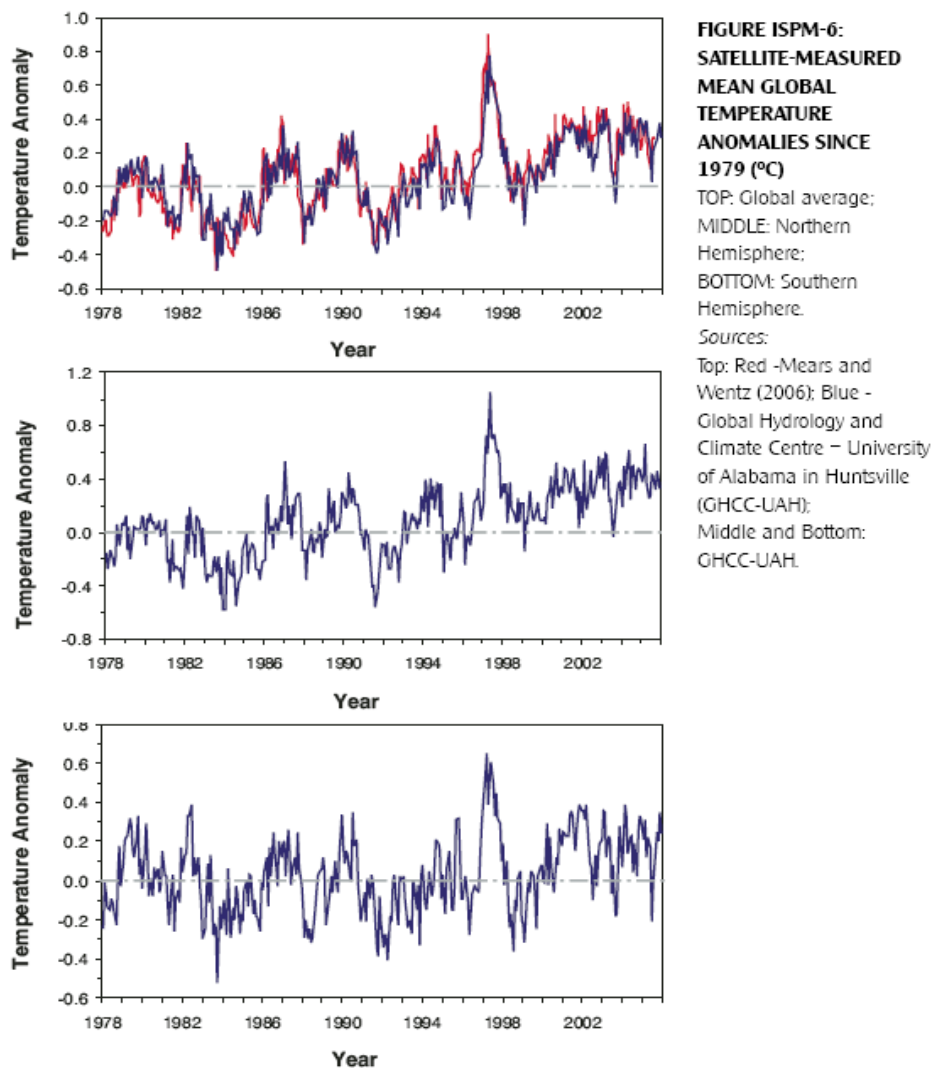


Figure 1. Lower troposphere temperature measured by satellites.

Figure 1 above is not presented in the most recent IPCC Assessment report or its Summary for Policymakers (SPM). It is found in a report, titled "The Independent Summary for

Policymakers", (ISPM 2007) ³ which was prepared by a number of scientists who are independent from the IPCC and who are of the opinion that recently observed climate conditions are still within the limits of natural variability. Interpretation of climate data presented by the SPM could be expected to be influenced by pre-suppositions.

The assumption of the ISPM authors is most probably that there is insufficient reason to assume that the current increase in CO₂ strongly influenced temperature increase in the manner assumed by the SPM authors; furthermore, the ISPM authors read from **Figure 1** that there is a levelling off of the previous temperature trend.

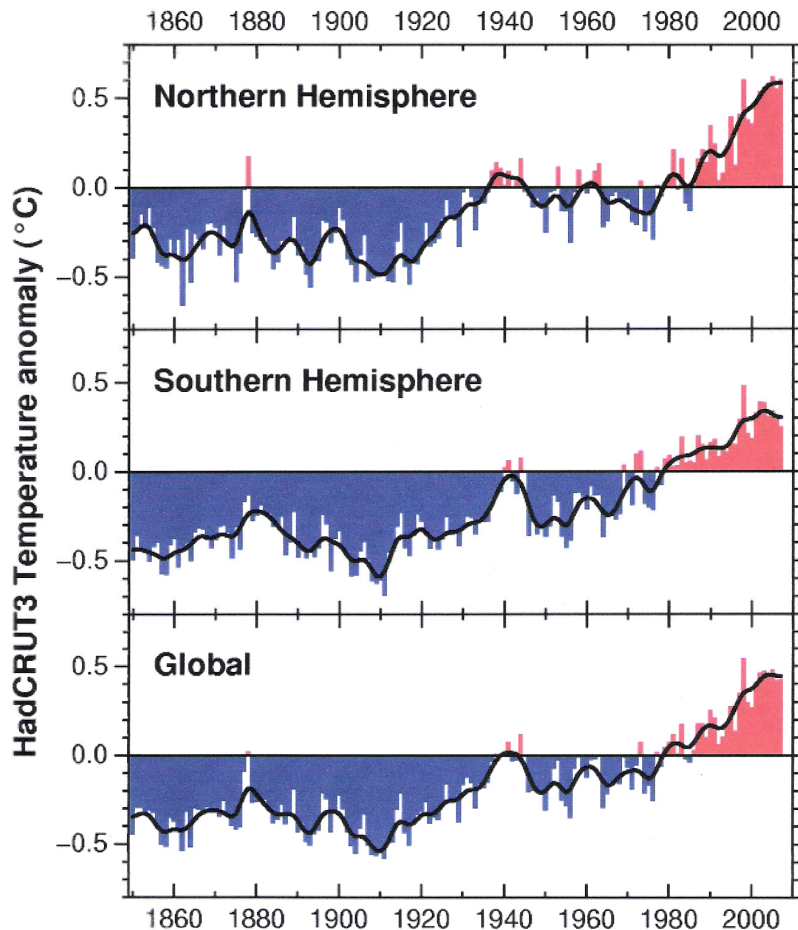


Figure 2. Surface temperature determined by the Hadley Centre.

The opinion of the SPM authors is based on **Figure 2**. The lower graph is of mean global surface temperature and shows a long-term rising trend, but it also shows the recent levelling off that is considered to be important by the ISPM authors.

The pre-supposition of the SPM authors is – as is also evident from their other statements – that further rise of CO₂ concentration *must* have a strong influence on the temperature rise. The SPM authors are apparently so sure of their case that they did not take the trouble to present the well-known **Figure 1** and its alternative interpretation in their report. It is also remarkable that the SPM authors (and those who propagate the IPCC-SPM view) did not consider the arguments of ISPM authors when their report was published. The ISPM

³ Published Paris, February 5, 2007. The Fraser Institute. <http://www.fraserinstitute.org/>

authors claim they used largely the same empirical evidence as presented by the SPM authors in the IPCC assessment report AR4 (Working Group 1 ‘The scientific base’’).

This neglect of an alternative interpretation is not proper in a scientific discourse. It can be argued that both the SPM and ISPM reports are reviews with specific interpretations of the authors and as such do not contain primary observations to be disputed. The ISPM is, however, also a critique of the SPM approach and it could have been expected that SPM authors would respond to that.

2. Climate change controversies and uncertainties

In public discussions in the Netherlands there was some minor response to the ISPM. This was restricted to the reply by SPM promoters that the ISPM merely focuses attention on uncertainties and failed to respond to the fundamental arguments of the ISPM authors.

An important point is that the controversy concerns the following questions and is not much about uncertainties of observations.

- (1) Is the theory used to explain the global greenhouse effect for small concentrations of infrared absorbing and emitting molecules (e.g. CO₂) sufficiently sustained to come to far-reaching conclusions?
- (2) How should cosmic influences, especially on cloud formation and distribution, be interpreted?
- (3) How are ground-based observation stations selected for inclusion in the calculation of global average temperatures?
- (4) What is the climatic influence of the oceans on the atmosphere?
- (5) To what extent can computer models contribute to the development of theories on climate variability and climate predictions?

The SPM authors give the impression that they know the answers to these questions in sufficient detail simply because they are the experts in the field.

To a large extent these five questions can be summarised into three essential issues: What is natural climate variability? Has it been disturbed by anthropogenic emissions of greenhouse gases and if so, how can we know? (See **Box 1**.)

Box 1: Open Letter to the Secretary-General of the United Nations

December 13, 2007

Re: UN climate conference taking the World in entirely the wrong direction

It is not possible to stop climate change, a natural phenomenon that has affected humanity through the ages. Archaeological, oral and written histories all attest to the dramatic challenges posed to past societies from unanticipated changes in temperature, precipitation, winds and other climatic variables. We therefore need to equip nations to become resilient to the full range of these natural phenomena by promoting economic growth and wealth generation.

The United Nations Intergovernmental Panel on Climate Change (IPCC) has issued increasingly alarming conclusions about the climatic influences of human-produced carbon dioxide (CO₂), a non-polluting gas that is essential to plant photosynthesis. While we understand the evidence that has led them to view CO₂ emissions as harmful, the IPCC's conclusions are quite inadequate as justification for implementing policies that will markedly diminish future prosperity. In particular, it is not established that it is possible to significantly alter global climate through cuts in human greenhouse gas emissions. On top of which, because attempts to cut emissions will slow development, the current UN approach of CO₂ reduction is likely to increase human suffering from future climate change rather than to decrease it.

The IPCC Summaries for Policy Makers cannot properly be represented as a consensus view among experts.

The IPCC Summaries for Policy Makers are the most widely read IPCC reports amongst politicians and non-scientists and are the basis for most climate change policy formulation. Yet these Summaries are prepared by a relatively small core writing team with the final drafts approved line-by-line by government representatives. The great majority of IPCC contributors and reviewers, and the tens of thousands of other scientists who are qualified to comment on these matters, are not involved in the preparation of these documents. The Summaries therefore cannot properly be represented as a consensus view among experts.

Contrary to the impression left by the IPCC Summary reports:

- *Recent observations of phenomena such as glacial retreats, sea-level rise and the migration of temperature-sensitive species are not evidence for abnormal climate change, for none of these changes has been shown to lie outside the bounds of known natural variability.*
- *The average rate of warming of 0.1 - 0.2 degrees Celsius per decade recorded by satellites during the late 20th century falls within known natural rates of warming and cooling over the last 10,000 years.*
- *Leading scientists, including some senior IPCC representatives, acknowledge that today's computer models cannot predict climate. Consistent with this, and despite computer projections of temperature rises, there has been no net global warming since 1998. That the current temperature plateau*

follows a late 20th century period of warming is consistent with the continuation today of natural multi-decadal or millennial climate cycling.

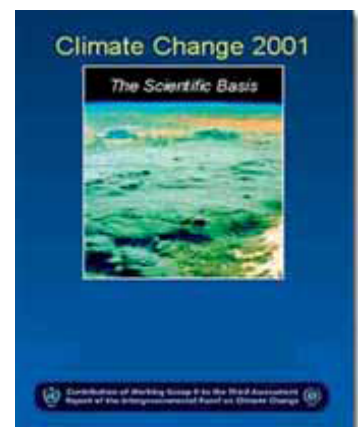
In stark contrast to the often repeated assertion that the science of climate change is 'settled', significant new peer-reviewed research has cast even more doubt on the hypothesis of dangerous human-caused global warming. But because IPCC working groups were generally instructed to consider work published only through May 2005, these important findings are not included in their reports; i.e., the IPCC assessment reports are already materially outdated.

The UN climate conference in Bali has been planned to take the world along a path of severe CO₂ restrictions, ignoring the lessons apparent from the failure of the Kyoto Protocol, the chaotic nature of the European CO₂ trading market, and the ineffectiveness of other costly initiatives to curb greenhouse gas emissions. Balanced cost/benefit analyses provide no support for the introduction of global measures to cap and reduce energy consumption for the purpose of restricting CO₂ emissions. Furthermore, it is irrational to apply the 'precautionary principle' because many scientists recognize that both climatic cooling and warming are realistic possibilities over the medium-term future.

The current UN focus on "fighting climate change", as illustrated in the November 27th UN Development Programme's Human Development Report, is distracting governments from adapting to the threat of inevitable natural climate changes, whatever forms they may take. National and international planning for such changes is needed, with a focus on helping our most vulnerable citizens adapt to conditions that lie ahead. Attempts to prevent global climate change from occurring are ultimately futile, and constitute a tragic misallocation of resources that would be better spent on humanity's real and pressing problems.

3. Consensus?

The SPM authors say they are 90% to 95% certain that human activities are the major cause of the increase in mean global temperature over the last 50 years. Their certainty is underlined by their pronouncement that thousands of experts have contributed to the IPCC Assessment Report, which is merely an assessment of the observations presented in the reliable scientific literature (peer reviewed journals). They state that this number of experts demonstrates there is a large scientific consensus that the rise in CO₂ is the major cause of recent global climate change. Reports by



McLean⁴ and Holland⁵ however provide an analysis of the creation and review of the most recent IPCC report and it throws some doubt on the claim that thousands of experts have contributed to the IPCC assessment. McLean calculated that some 800 individuals – not thousands – were involved with the creation and review of the Working Group I report. This is a fraction of the number of scientists - not all climate scientists - who signed the so-called Oregon petition⁶ that is critical of the claim that atmospheric CO₂ concentration is a major driver of climate change.

This raises the fundamental question in the scientific world of how to balance the opinions of experts and non-experts. An important conclusion of McLean is that only five expert reviewers univocally sustain the most important chapter of the recent assessment report (WG1, chap 9 ‘attribution’). When the ultimate WG1 report was published in November 2007 far more than five contributors to the IPCC work raised their voices to forcefully to say that the report underestimates the danger of climate change caused by anthropogenic emissions of CO₂. This call for attention (to the press) was not sustained by new facts that could have arisen since the first drafts of the report in 2006. The data of **Figure 1** indicates rather the opposite - since 1998 the CO₂ concentration has increased by 13 ppm (i.e. 4 percent) without a corresponding increase in the global average temperature.

4. The sceptics' viewpoints

The introduction of this discussion paper posed the question as to why supporters of the SPM are so sure of their case. That same question can be posed with respect to critics of the SPM: What makes them so sure that the science is not right and that humanity has little to worry about?

If it becomes obvious in the near future that the danger of climate change has been exaggerated, then serious damage to all science may result.

It should be mentioned first that the ISPM authors are not entirely sure of their case. The ISPM points out that the IPCC reports contain valuable information and that certainly an increase in CO₂ concentration might affect climate, but this has not been confirmed by careful follow-up studies. Critics of the SPM object, saying the SPM's supporters are strongly exaggerating their case that the case is not based on adequate empirical observations, is insufficiently sustained by theories, and is based on disputed computer models.

⁴ J. McLean “Peer review, what peer reviews? Failures of scrutiny of the UN’s fourth assessment report (2007) http://scienceandpublicpolicy.org/sppi_originals/peerreview.html

⁵ D. Holland. Bias and Concealment in the IPCC process: The Hockeystick affair and its implications. *Energy and Environment* 18 (7+8), 951-983, 2007

For collection of comments on IPCC procedures by others see <http://mclean.ch/climate/IPCC.htm>

⁶ The Oregon petition, April 1998 <http://www.oism.org/pproject/>

This paper is limited to the consideration of the practice of the science as it pertains to the content of the SPM from the perspective of the philosophy of science Labohm⁷ provides a more elaborate critique of the processes inside the IPCC that lead to particular conclusions.

The proper conduct of climate science according to the principles of science philosophy may be very important. If it becomes obvious in the near future that the danger of climate change has been exaggerated⁸ then serious damage to all science may result.

The critics of the SPM provide arguments that suggest such exaggeration has happened. The central arguments were provided in **Box 1**.

5. The image of science

Section 4 raises questions: what is the reputation of science, and to what extent could this be damaged by developments in climate research?

The public usually assumes that something must be ‘true’ when a large group of experts in a particular field support a certain claim. They also assume that critique of the statement by non-experts has no significance. Yet the history of science is replete with important examples, in different disciplines, of scientists who were on the wrong track for periods of half a century or more. Making mistakes is human and scientists are human beings. Being an ‘expert’ is not a guarantee of being right.

The reputation of science has survived the past errors, and the practice of science as a serious activity was not hindered by past scientific misconceptions.

So, what would be the likely effect on the image of science if the average global temperature does not continue to rise as is suggested by the SPM authors?

Here we need to recognize that we are concerned with the reputation of the sciences among the public at large, and in particular by politicians who are responsible for far-reaching decisions claimed to be based on scientific observations.

The public and politicians accept the statements of the ‘experts’ as being ‘true.’ This view of ‘truth’ is acceptable as long as the critique of the non-experts (but experts in neighbouring disciplines such as astronomy, geology, and paleobiology) does not involve fundamental issues of science philosophy and style of scientific discussion. Here some fuel for thought is produced by both the non-experts and also some experts⁹ who claim that by following a public (political) fashion¹⁰, current mainstream climate research is demonstrating herd-like behaviour¹¹ (over-valuation of consensus), and of tunnel vision (insufficient attention for alternative views). Indeed, the term ‘pseudoscience’ has been used as a description of some climate research approaches and assessment studies. This will be

⁷ H. Labohm. What is wrong with the IPCC?

<http://scienceandpublicpolicy.org/other/whatiswrongwiththeipcc.html>

⁸ Bas van Geel. At a NIPCC seminar The Hague, 3 July 2007 and referenced in NWT in Dutch.

⁹ The authors of the ISPM and the recent published report of the organization NIPCC, Non governmental international Panel on Climate change.

¹⁰ R. Spencer. “Climate Confusion. How global warming hysteria leads to bad science, pandering politician and misguided policies that hurt the poor. “. In press for 27 March 2008

¹¹ T.Gold. New Ideas in Science. J. of Sci. Exploration, Vol. 3, No. 2, pp 103-112, 1989

elaborated below but, in anticipation, the question could be asked as to whether those reproached could be challenged from the beginning. As yet few if any attempts have been made by the IPCC followers to challenge the important issues listed in **Box 1**. The general perception of the sceptics and critics of the IPCC followers is that supporters of the SPM arrogantly avoid discussion and hide behind their asserted expert consensus.

It should be a primary task of learned societies like the U.S. Academy and the U.K. Royal Society¹² to investigate whether the maintenance of the expert position, and /or that the reproaches in the climate debate are justified. This could avoid damage to the image of science by the IPCC followers or their critics. So far no initiatives in this respect have been sufficiently honoured. Most evaluations by the various institutions have been restricted to considering unbalanced presentations of either view. They have provided little ‘expert’ evaluation of the arguments from the viewpoint of the general philosophy of science.

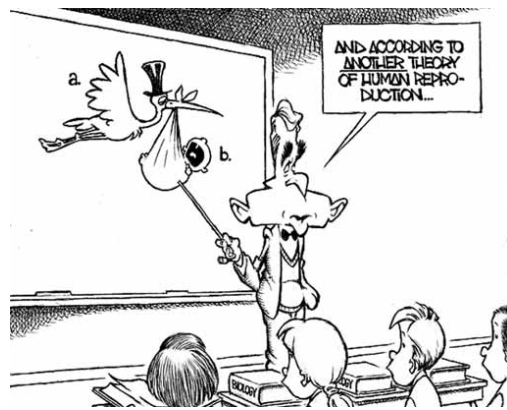
Whether or not it eventually becomes possible to definitely attribute recent and future temperature rise to a significant anthropogenic influence there is an important need for an investigation of the scientific arguments being used and the conduct of the science. The accuracy of the expert consensus view is irrelevant here, because it does not answer the question; was that a pseudoscientific or scientific prediction according to our western standards?

6. Pseudoscience

There is a common misunderstanding that pseudoscience is the same as poor science. Science philosophy defines pseudoscience as *being any body of knowledge, methodology, belief, or practice that claims to be scientific or is made to appear scientific, but which fails to adhere to the basic requirements of the scientific method.*

Most importantly, pseudoscience is often based on a dogma that cannot or should not be challenged. Astrology, scientology and creationism are generally considered to be pseudoscience by most philosophers of science. They are fields of ‘belief’ or opinion and in Plato’s terms the supporters are sophists.

In a recent handbook, “Philosophy of Science; The Central Issues”¹³, the authors try to draw a sharper demarcation line between real and pseudoscience. This proved to be more difficult than expected, not least because opinions differ on what makes a part of a scientific discipline genuinely ‘scientific.’ True science requires that the rules of good scientific practice to be observed. Occasional violations of those rules do not necessarily imply that the relevant branch of science should be regarded as pseudoscience. However, suspicion arises if serious violations are frequently tolerated, and not condemned or even challenged.



¹² The arms of the RS reads ‘Nullius adictus jurare in verba magistri’.. Not be obliged to swear on the word of the master..

¹³ M. Curt & J.A. Cover, editors. Norton 1998

The philosophical discussion on the demarcation between science and pseudoscience mainly focuses on the observance of the established rules for testability, confirmation and falsifiability of theories, hypothesis, ideas, and convictions. This does not necessarily imply the need to dismiss the different approaches as pseudoscientific because the confirmation of a hypothesis may take many years. An important issue is whether there is a *willingness* among the researchers to falsify hypotheses or, conversely, to repeatedly ignore or dismiss evidence that does not support the claims being made.

7. Ringing ‘alarm bells’

The first clear sign of alarm bells ringing is the frequent reference to the number of scientists who adhere to a particular view and the implication that a consensus proves their view is correct.¹⁴ Many non-scientists are probably susceptible to this argument because they are unfamiliar with the many examples in the history of science where large groups of scientists clung to hypotheses that were ultimately proved to be wrong.

Another ‘alarm bell’ is in the frequent ‘ad hominem’ attacks made by mainstream scientists against their non-mainstream colleagues, (e.g., by referring to alleged financial or other interests of opponents) and diverting attention from the main subjects being discussed.

Another ‘alarm bell’ is in the frequent ‘ad hominem’ attacks made by mainstream scientists against their non-mainstream colleagues, (e.g., by referring to alleged financial or other interests of opponents¹⁵) and diverting attention from the main subjects being discussed. This indecent behaviour remains rare among scientists in the Netherlands but there is another tactic used to impose silence on opponents of the IPCC view. Those sceptical of the IPCC’s claims may be invited to comment on local reports but this merely pays lip-service to the notion of including all opinions and points of view. Often these comments are discarded because it is claimed that they do not fit in the context of the note. This tactic has been adopted by the IPCC in relation to the review of its most recent assessment reports.¹⁶

¹⁴ E.g., in the US to the number of people that support creationism and intelligent design

¹⁵ An historical example is described by M.D. Coe. ‘Breaking the Maya Code. Thames and Hudson 1992 It concerns the case Thompson versus the Russian Knorosov. Thompson:” Does Knorosov has any scientific honor? The answer is clearly NO. His decipherment is a Marxist hoax and propaganda ploy” In the climate debate is rather frequently suggested that ‘sceptics’ have an interest in the energy industry. E.g. S. Rahmstorf (advisor to the German prime minister) “ Gerd-Rainer Weber has a long employment with the German coal industry” (<http://www.pik-potsdam.de/~stefan/klimahysterie.html>.)

¹⁶ Everybody in the world could announce oneself as a ‘reviewer’ to criticize the draft reports. But the use of these comments was restricted to improvement of the text, and hardly changed the content. For criticism of the digestion see <http://climateaudit.org> (S. McIntyre)

Mann et al¹⁷ presented, in the peer reviewed literature, a tree ring analysis that indicated that warming at the end of the 20th century was unprecedented over the last few thousand years. The paper became a key issue in the Third IPCC assessment report (2001). The conclusion was based on a complicated statistical treatment and to the concern of many, it ignored the rather well-recognized warm-medieval period.

The statisticians McIntyre and McKittrick¹⁸ reinvestigated the data and presented evidence that the conclusion of Mann et al was not justified. But worse, Michael Mann and his co-authors initially refused to provide their data for this independent audit and so far have not provided the algorithm they used for the computation. This is unprecedented in other natural science disciplines. Published results by authors should always be subject to reproduction by other authors before being generally accepted. Most worrying to those in the Netherlands is that the authoritative meteorological station, KNMI, continues to issue messages that deny the Mann publication is most likely an example of scientific fraud.

Another example is in the selection of ground-based meteorological stations to calculate a global average temperature.

The IPCC WGI SPM includes the lower graph in **Figure 2** of this paper. The data for this graph originates from the authoritative Hadley Centre in Great Britain¹⁹, which calculates the average global temperature from the measurements of a limited number of ground-based meteorological observation stations. It is obvious that the result of the calculation will be strongly dependent on the stations that supplied the data, so the question arises as to how stations are selected to be suppliers of this data, which stations were considered to be reliable, which were not, and on what grounds²⁰. This question has not yet been answered hence the reproducibility of the findings remain impossible and the integrity of the estimates of mean global temperature are unknown. When a Dutch science journalist brought this matter to the attention of the KNMI he was told that the selection method was available but the institute was unable to produce him with the evidence.

These three examples of ‘ringing alarm bells’ - appeal to consensus, ad hominem attacks and failure to produce data and/or describe methods - may just be isolated incidents. Such violations of Good Scientific Practice occasionally occur in all disciplines and are insufficient to judge a whole branch of science as being corrupt but the poor reaction of an institute like KNMI – and several others in the world – to the findings of the critics is in itself worrying as a follow-up of the incidents.

¹⁷ M E.. Mann at al. *Geophysical Research Letters*, 26(6) 759

¹⁸ McIntyre, S., and R. McKittrick, 2003: Corrections to the Mann *et al.* (1998) proxy database and northern hemispheric average temperature series. *Energy and Environment*, **14**, 751-771.

Wegman *et al.*, (2006): Ad Hoc Committee report on the “Hockey Stick” global climate reconstruction, commissioned by the US Congress House Committee on Energy and Commerce, 2006.

[http://republicans.energycommerce.house.gov/108/home/07142006 Wegman Report.pdf](http://republicans.energycommerce.house.gov/108/home/07142006%20Wegman%20Report.pdf)

¹⁹ P.D. Jones & A. Moberg “”Hemisphere and large scale surface air temperature. An update to 2001: J. of Climate, 16, 206-233, 2003.

²⁰ “R.R, McKittrick & P.J. Micaels. “Quantifying the influence of anthropogenic surface processes and inhomogenities on gridded global climate data. J. of Geophysical Research Atmosphere. In press.

8. Principles of scientific decision making

Few people will doubt that institutes like KNMI, The Hadley Centre, and NOAA at Boulder are contributing to better understanding of meteorological processes. The primary critique of scientific decision-making by these institutions does not apply to violation of rules for good scientific practice in the research of these well-known institutes, but concerns their interpretations of overviews (as presented by IPCC) on climate, how they bring these to public attention through their PR departments, and of course the dogma that an increase of CO₂ concentration in the atmosphere must lead to dangerous temperature rise.

This brings us to the arguments on which the AGW thesis is based. Then we will discuss some basic issues about how scientific decisions are made in climatology, compared with other branches of science, and to the problems of how established decisions can be disputed. The fundamental question is whether the theory used to explain the global greenhouse effect for small (increased) concentrations of infrared absorbing and emitting molecules (e.g., CO₂) is sufficiently sustained to permit far-reaching conclusions.

The extent that a particular agent (e.g., CO₂ or the sun) can change the atmosphere's radiation balance is defined as 'radiative forcing.' The ISPM strongly argues that this is a modelling concept that is not deduced from experimental evidence *in situ* and goes on to cast doubt on the value of all computer model predictions that take the adopted values for radiative forcing for granted. When a model uses a large value to convert CO₂-based radiative forces into temperature and a lower factor to convert the poorly-understood solar forces into temperature it is inevitable that CO₂ will be seen to have the greatest impact.



9. Modelling in climatology

The modelling of processes has become a very important tool in almost all sciences. It is especially a good tool to learn and understand the interaction of forces in complex systems. Of itself, the output of a model is never proof that the constructed virtual world corresponds to reality because as noted above, the outcome is highly dependent on the assumptions that the model incorporates.

In chapter 4 of the ISPM the limitations of the use of computer models in climatology are extensively discussed. In the context of this paper it is especially of importance to note that to bring a climate model into alignment with historical data from observations required an 'optimization' of that model. This means that if a model does not fit those observations then various parameters are changed to reach a better agreement. Many climate processes are poorly understood or cannot accurately be described in mathematical terms and this requires the models to use approximations. This is not unique to climate science because similar approaches are also used in the process industry to simulate phenomena (e.g., in furnaces and ventilators) when developing improved designs. The use of approximations will however reduce the value of any forecasts because the values might not be accurate in all circumstances and the approximated data may be used in certain critical processing (e.g. the

approximation might be scaled and then a decision about the subsequent processing be based on the scaled value).

The ISPM states (section 4.3c) that the atmospheric system is so complex that even if a model, after a particular parameterization, simulated the current average climate accurately there is no guarantee that it would be able to accurately forecast future developments. The parameterization can be improved when it fails to match observations and this continued testing of models should lead to continued improvement.²¹ And this is also, for model makers in other disciplines, an interesting development. But the question remains whether, given the fundamentals of complexity theory²², it *ever* will be possible to model the complex chaotic atmospheric system in a manner that would produce a reasonable projection of any future expectation. This doubt seems to be foreign to today's users of climate models.

The application of models in climatology appears to be used far more often to attempt to confirm a dogma rather than to attempt to falsify a hypothesis. Parameterization, which in principle is a pseudoscientific approach, has crept up almost unnoticed in the decision-making regarding future climate developments.

The belief in models is apparently very strong in the IPCC circles and any attempts to refute this are not appreciated even when the refutation includes observational data.

This is a very important point in the development of science in general. Will this approach of parameterization also be accepted in other disciplines? Or will it be condemned on the basis that computer simulations without parameterization encourage the investigation of the imperfection of the assumptions?

Douglass et al²³ recently reached the conclusion that the models of the calculated temperature lapse rate in the tropics do not fit observations and at 8 km altitude disagree on the sign (+ve or -ve). When the Dutch popular science journal, *NatuurWetenschap & Techniek*,²⁴ asked a KNMI collaborator for an opinion on this paper he simply endorsed the IPCC's claim that a doubling of the CO₂ concentration in the atmosphere will lead to a global average temperature rise of 2 C. The belief in models is apparently very strong in the IPCC circles and any attempts to refute this are not appreciated even when the refutation includes observational data.

²¹ D.A. Randall, "General Circulation Model Development, Past, Present and Future, Academic Press 2000

²² The law of predictable unpredictability.

²³ D.H. Douglass, J. R. Christy, B.D. Pearson & S.F. Singer. "A comparison of tropical temperature trends with model predictions" *Int. J. Climatology* (2007) Published on line www.interscience.wiley.com DOI:10.1002/joc 1651

²⁴ January 2008, page 8. "Alarm. The tropics are too cool"

10. The progress of science

If a branch of science accepts pseudoscientific approaches, then it may be detrimental to the progress of science especially if dogmas are not continuously subjected to the test of falsification. Scientific progress depends on continuously producing new ideas once doubts arise about the old ones. Empirical observation shows that the scientific community rarely accepts those new, probably immature, ideas with great enthusiasm from the beginning. But even concepts that are incompletely developed should be critically appraised and attempts made to falsify them. The willingness to do so seems underdeveloped in the IPCC circle.

The IPCC documentation does not include a graph of MSU-based lower tropospheric temperatures (see **Figure 1**) and yet this graph indicates that there may be something wrong with the assumption that a CO₂ rise in the atmosphere *must* lead to global temperature rise. See **Box 2**.

There are even suggestions that the IPCC has deliberately suppressed new hypotheses that refute or cast doubt on its own claims.

A healthy scientific discourse usually proceeds as follows: A paper is published describing a new scientific insight and opponents may criticize it in subsequent papers or similar open discussion forums. If the author of the first paper considers that criticisms are somehow in error then the criticism may be refuted or the original paper may be refined. A recent tactic appears to be that subsequent discussions will ignore the third step, a refutation of the criticism or refinement of the original, and concentrate only on the initial paper and the subsequent response.

Box 2: The theory of enhanced greenhouse effect needs reinvestigation

The current theory of the greenhouse effect is well described in several textbooks²⁵. It takes into account the classical physical laws for absorption and emission of radiation, united in a non-linear differential equation, which by computation leads to a simulation of the temperature lapse rate in the atmosphere.

The textbooks also indicate why observations do not match the empirical evidence at a particular site: the way a radiation balance is established in the atmosphere is not only dependent on the absorption and emission at particular altitudes, but also by the complex vertical heat transports by air masses and especially water vapor. It is still impossible to simulate these processes satisfactorily. Nevertheless one can think of a theoretical approach in which is reckoned with a global average of the radiation balance, and a global average of the temperature lapse rate, assuming that the influence of airflow averages out over space and time. Still, the influence of increased CO₂ concentration on

²⁵ D.L. Hartmann, Global Physical Climatology. Academic Press 1994
K.N. Liou, An Introduction to Atmospheric Radiation. Academic Press 2002

*temperature by enhancement of the greenhouse effect, registered over the last decade, does not seem to match observations (see **Figures 1 and 2**). This provides some doubt to the assumption that the above classical physical laws are sufficient to describe the effects of radiative processes in the atmosphere.*

Remarkably little research on this discrepancy has been performed lately, despite the problem being extremely important to all considerations about the possible enhancement of the greenhouse effect as a result of anthropogenic emissions.

In 2006, Essenhigh²⁶ published a paper that was neglected by IPCC authors. His paper provides an analysis based on his experimental experience of radiative effects in furnaces. His analysis makes the remarkable suggestion that the radiation balance in the atmosphere is largely a result of the lower absorption bands of the abundant presence of H₂O and is only little affected by the CO₂ concentration and its absorption bands. His analysis suggests the gas mixture in the atmosphere as a whole acts as a fluorescent body, and increased absorption at relatively short IR wavelengths of a minor constituent of the atmosphere (CO₂) may be counteracted by increased emission of the major constituent (H₂O) at its longer wavelengths.

A reappraisal of the radiative greenhouse effect using molecular physics seems to be indicated.

Two examples from the Netherlands:

When McIntyre and McKitrick published their objections to the collected observations by Mann, the latter hastened to refute the objections. The same issue of the journal in which Mann's refutation was published also included a rebuttal by McIntyre and McKitrick but a KNMI staff member ignored this final rebuttal when commenting on the matter.



Multatuli

When Svensmark and Friss-Christensen launched their idea that cosmic rays influence cloud formation and therefore the climate²⁷ it was quickly refuted. The empirical evidence supporting the original idea was certainly not perfect, but Svensmark and Friss-Christensen capably responded to the refutation. In an oral dispute (in Leiden, July 2007) I quoted the original paper and the next day my opponent from the KNMI hastened to bring the refutation to my attention, but not the subsequent response.

²⁶ H. Essenhigh. Prediction of the standard atmosphere profile of temperature, pressure and density with high for the lower atmosphere by solution of the Schwartzchild integral equation. *Energy & Fuels* 2006, 1057-1067.

²⁷ For an overview of references see: H. Svensmark & N Calder "The Chilling Stars; a new theory of climate change, Icon books Ltd 2007

The theory of Svensmark is certainly not beyond criticism, although paleobiological²⁸ and astronomical (see **Box 3**) research seem to support it, but in his attempts to find experimental confirmation he remains seriously thwarted.

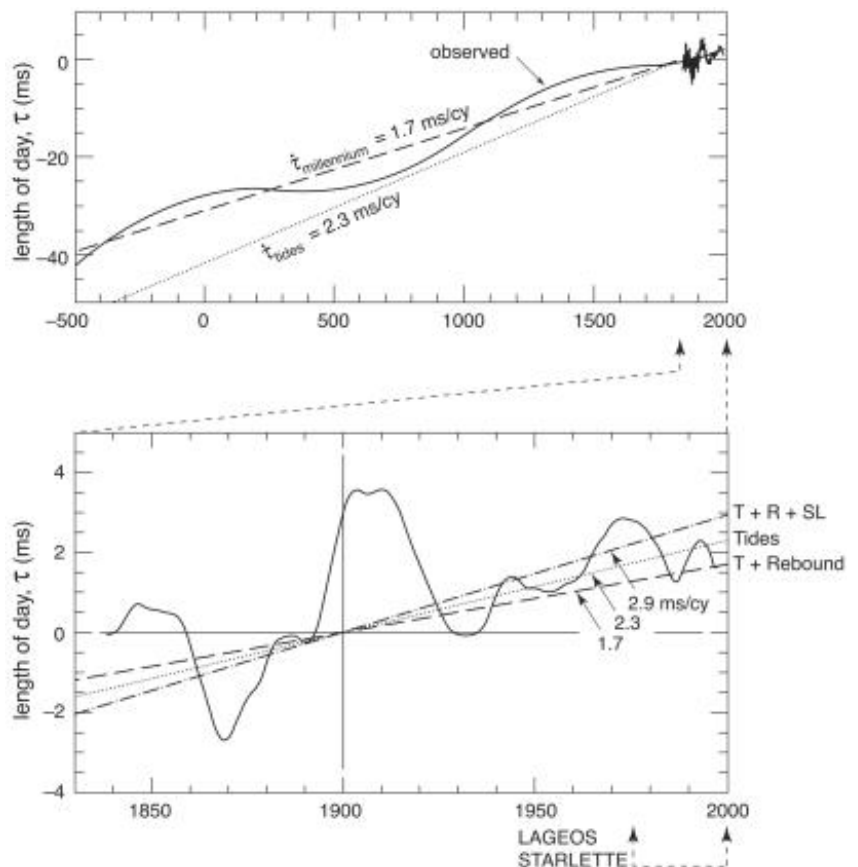
In short, this is the theory of Svensmark and how it could be tested. The amount of cloud cover has a strong influence on meteorological conditions and therefore on the climate. Cloud formation depends on the formation of condensation nuclei. Their formation is expected to be dependent on the intensity of cosmic rays. The latter is determined by the fluctuating magnetic fields of the sun and the earth, and in accordance with a very old and rather well-established astrophysical and geological theory an indirect effect of the sun on climate is expected. It was suggested that the theory could be experimentally tested by mimicking the effect of cosmic rays in a cloud chamber with the help of the particle accelerator at CERN in Geneva. The use of this instrument is costly and so each project is subject to rigorous peer review in advance. A project proposal was submitted about year 2000, but judges from the climate establishment objected to it. One, a Nobel Prize laureate, pointed out that it would be a waste of resources because of the great consensus on the causes of global warming. This led to a heated discussion that delayed the project for seven years. Because of priorities at CERN the first results of this research are now expected in 2012. Meanwhile, by using more primitive techniques than are available at CERN, Svensmark has been able to develop his theory a little further.

Svensmark experienced what a partisan Dutch writer of the 19th century, Multatuli, referred to as “the hindrance of free study and of truth finding”. In our time a major cause for this hindrance is the limitation of finances for costly projects which by necessity are subjected to peer review, a process that unfortunately often requires the implicit consent of the established order.

Box 3 Why the sea level is probably not accelerated in its rising.

Figure from Munk 2002²⁹

The moon has a uniform deceleration effect on the rotation of the earth through its effect on the tides, which is calculated as 2.3 msec per century. This influences the moment of inertia of the



²⁸ B. van Geel, O.M. Raspopov, H. Renssen, J. van der Plicht, V.A. Dergachev, & H.A.J. Meijer, 1999) The role of solar forcing upon climate change. Quaternary Science Reviews 18: 331-38

²⁹ W. Munk “Twenty century sea level rise; an enigma. PNAS May 14, 2002 vol. 99 no. 10, 6550–6555

globe. The observed deceleration is, however, 1.7 msec. The difference (0.6) is ascribed to the deformation of the earth's crust; the rebound effect caused by the decrease of the ice caps since the latest great glacial. In the upper figure it is presented that over the last 2500 years the change of the rotation speed (Length of Day LOD) deviates a little from the average. The two peaks correspond with the warm Roman period (year 0) and the warm middle ages (1200 AC). In between is a relative cool period. The warm middle ages were followed by the little ice age, which corresponds again with a decrease of the deceleration of the rotation velocity. It is supposed that the change in the moment of inertia is due to the change of the volume of the ocean water, which expands in warm periods.

In the lower graph the change in LOD is presented for the period after the little ice ages (1850), in which average global temperature increased by 0.6 – 0.8 C. The figure shows three base lines, one marked 'tides', which corresponds with the calculated effect of the moon (2.3 msec/century), one T+ rebound, (1.7 msec/century as the deceleration is observed), and a third one marked T+R+SL with a slope of 2.9 msec/century, in which the assumed effect of Sea Level rise, due to climate change since the little ice age is incorporated. The whimsical observation of the deceleration fluctuated around the second curve and stayed largely below the curve taking in account the sea level rise. This suggests that the so-far-measured, accelerated local sea-level rise is not global representative³⁰.

A new view on these observations has recently been presented by Wilson³¹ in which it is suggested that the cause/effect relationship may be reversed³². He takes as a starting point that the observations on the variability of the moment of inertia of the earth originates from the mutual gravitational interactions of the sun, the moon, and the planets. He observes an interesting coincidence of the result of these interactions, not only with the tides, but also with changes

³⁰ Chapters 3 and 5 in the IPCC assessment report AR4 WG1 deal with the uncertainties in the measurements of sea level rise and the melting of ice caps. On the ice formation on Greenland is noted: “ *it is reasonable to estimate that the behaviour from 1961 to 2003 falls between ice sheet growth of 100 Gt yr⁻¹ and shrinkage of 200 Gt yr⁻¹.* (Page 365). However, in a special section ‘frequent asked questions’ (page 409) is mentioned. *Yes, there is strong evidence that global sea level gradually rose in the 20th century and is currently rising at an increased rate, after a period of little change between AD 0 and AD 1900. Sea level is projected to rise at an even greater rate in this century. The two major causes of global sea level rise are thermal expansion of the oceans (water expands as it warms) and the loss of land-based ice due to increased melting.* This is not an unusual tactic in IPCC messages - scientific uncertainties are presented in the detailed text that is not readily accessible to a wide audience of non-scientists, but the text for that audience includes far-reaching conclusions without any hint of those uncertainties.

Munk's enigma is mentioned several times in AR4 WG1 but never subjected to a critical consideration.

³¹ Ian R. G. Wilson. Are Changes in the Earth's Rotation Rate Externally Driven and Do They Affect Climate? Personal communication Manuscript submitted for publication.

³² For an overview of possible reversed cause effect relationships see A. Rörsch, “Climate science and the phlogiston theory; weighing the evidence. E&E, 18 (3-4) 433-448, 2007

in major ocean currents, such as El Nino and the North Atlantic Oscillation, and therewith the small climate changes which have been observed during the last centuries. Consequently, this raises the possibility that all recent changes in climate indicators may result from 'cosmic' fluctuations, as suggested also by Svensmark, although on different grounds, and that increasing CO₂ concentration in the atmosphere is of minor importance.

11. The inheritance of Multatuli

Multatuli, (nom de plume for Eduard Douwes Dekker 1820-1877) belongs in a list of the five most famous Dutch writers over the last five centuries. He was a civil servant in the East Dutch Colony, today known as Indonesia, before moving into writing. His initial works were political writings about the exploitation of the poor people and the involvement of Indonesia's ruling princes, but later he moved into philosophical issues. Within his complete works, many times re-edited and titled "Ideas" is a remarkable speech he presented at the University of Delft on the need for Freedom of Study, and how it is violated.

He defined Freedom of Study as the unhindered striving for the truth. Among those hindrances he explicitly mentioned: the forcing down of a prejudice, the hindering of research, and the incompetence of researchers (all in idea no. 554), and misreading or poor understanding of arguments, the official twisting of the truth, and the adherence to the words of the 'masters' (all in idea no. 590)

The computer-based projections for future climate change are intended to sustain a dogma rather than to challenge assumptions.

Today's descriptions of violations of rules for good scientific practice, such as the definition of pseudoscientific approaches, and selective quotation from the literature, are in fact Multatuli's ideas in a new guise.

In the preceding sections I have presented some developments in climate change research and the alarming public messages that accompany them, all in light of Multatuli's criteria. I did not consider his 'incompetence of researchers' because that is beyond my current authority, but I think I can judge the quality of public performance of spokespersons from the authoritative scientific institutes in the Netherlands, e.g., the KNMI, the agency for the Environment (MNP), and the University of Wageningen. I have some comprehension of the social motivation of these spokespersons to warn against possible dangerous developments. However their claims that these are scientifically based remains poor.

In summary, climate science has allowed pseudoscience elements to distort the issues. The suggestion that the warming trend in the 20th century, after the little ice age, will continue in the 21st century is not sustained by empirical evidence. The assumed relationship between the rise of CO₂ in the atmosphere with considerable temperature rise is doubtful. The computer-based projections for future climate change are intended to sustain a dogma rather

than to challenge assumptions. We regularly observe official authorities manipulating or providing distorted interpretations of data.³³ Fraudulent practice has been tolerated.

Acknowledgement

This content of this paper has been subject to a lively discussion among some 25 scientists from a large variety of disciplines, from all over the world. Many useful comments for improvement of six subsequent drafts were received, but no attempt was performed to reach 'consensus'. Most useful were the contributions from those who are familiar with computer modelling in other disciplines than climatology. Herewith the author acknowledges especially the contributions of John McLean (Australia), Sonja Boehmer (UK), Doug Danhoff and Laura Nelson (Escalon, California, USA) to improve the use of the English language.

Bio

Dr Arthur Rörsch has a degree in chemical engineering from the University of Delft (1957), and a PhD from the University of Leiden (1963). He is a knight in the order of the Dutch Lion (1995). He was associate professor in Molecular Genetics (Medical faculty, Leiden) from 1967 to 1997 and his major fields of interest as an experimental scientist were in radiation biology, plant genetics and biological evolutionary theory. His major position was member, later vice president, of the board of management of the Netherlands (large) Organisation for Applied research, TNO, (1980-1995) with especially responsibility for the research fields Public Health, Food & Agriculture, and Environment. In the European circuit he was involved in committees on the assessment of the quality of EU projects and the performance of institutions. As Secretary General of the European Molecular Biological Conference, (a political body of 10 member states) he learnt how scientific issues are processed in governmental policy making. As chairman of the National (Dutch) Council for Agricultural research he worked for four years (1995-1999) on the development of scenario's and forecasting projections from the theoretical and applicable point of view. His current main interest is in the maintenance of rules for Good Scientific Practice in a variety of disciplines and how they may be violated. He investigated over the last decade, as well for the accusation as the defence, allegations of scientific fraud in the fields of immunology, clinical psychology and in environmental sciences. As member of the scientific advisory board of the Dutch popular journal on science (Natuur, Wetenschap and Techniek since 1970) and having been responsible for the public relations of TNO, he has also a major interest in the quality of information that is provided to the people of large from the scientific community through modern science journalism.



³³ Example. At the end of the Bali conference, December 2007, the Hadley institute reports that 2007 will again belong to the 11 warm years over the past century. But the data made available through its website indicate a slight decrease of global average temperature since the last years.