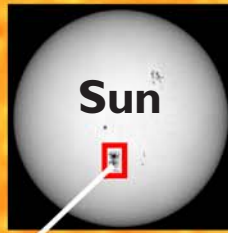


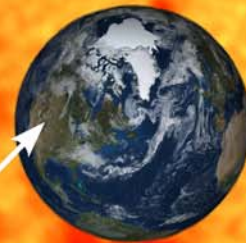
# Climate Change

By Dr. A. Neil Hutton



Sunspot

Relative size  
of the Earth



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# Climate Change

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# CLIMATE CHANGE I:

## *Global Warming Debate*

by Dr. A. Neil Hutton

A while ago, it came to my attention that APEGGA was undertaking a survey of Members' views on the subject of Climate Change. In reviewing responses to other surveys, such as those generated by AAPG, it was evident that the responders ranged over an entire spectrum of opinion. Many appeared not to be fully conversant with the range of current, related research or were relying only on the uncritical reporting by the media. On the whole, the media have done a remarkably poor job in reporting on global warming. Typically, the reports have been a simple regurgitation of the spin produced by the Intergovernmental Panel on Climate Change (IPCC).

The use of the term "spin" may seem an unusual way in which to characterize objective scientific reports. However the IPCC Summary for Policymakers (SPM), where the media generally obtain their information, does not always reflect the opinions in the scientific report and in some instances actually contradicts the conclusions of the scientists. For example, the IPCC Summary for Policy makers, (IPCC 2001b, p. 10) states that "there is new and stronger evidence that most of the warming observed in the last 50 years is attributable to human activities". Although in the scientific report itself, (IPCC 2001a, Chapter 1, p. 97) the conclusion is quite different: "The fact that the global mean temperature has increased since the late 19th Century and that other trends have been observed does not necessarily mean that an anthropogenic effect on the climate system has been identified. Climate has always varied on all time scales, so the observed change may be natural."

In an extraordinary move last spring the IPCC released the 21-page SPM for the Fourth Assessment Report (2007) more than three months ahead of the 1,600-page scientific report. This was to ensure that the scientific report was consistent with the SPM. In other words the science was not to conflict with the politics!

The general public and the media, apparently, are quite unaware of these contradictions and are much taken up with the emotional aspects of the reports of melting arctic ice, glaciers, and the snows of Kilimanjaro, as well as many other weather catastrophes appearing in the press. In the northern hemisphere there has been warming;

however warming, in itself, does not prove the hypothesis of global warming as a result of the release of carbon dioxide in the atmosphere. Nevertheless, the manmade, or "Anthropogenic, Global Warming, Hypothesis" has been widely accepted by the media and the public. Global warming studies have become big business. Indeed, it has attained near religious status among the green lobby, resulting in unwarranted personal attacks on some scientists' credibility and integrity and attempts to place them in the same category as holocaust deniers. The objectivity and impartiality of peer review has been compromised while research funding becomes more difficult to obtain for those expressing critical views.

At this point I will quote a comment by meteorologist Piers Corbyn in the Weather Action Bulletin, December, 2000: "The problem we are faced with is that the meteorological establishment and the global warming lobby research bodies which receive large funding are now apparently so corrupted by the largesse they receive that the scientists in them have sold their integrity." It is worth mentioning here that even under President George Bush, the United States has spent \$29 billion on climate research in the last six years. This is more than double what was spent on the Apollo Space Program.

The SPM of the IPCC Fourth Assessment Report made four basic points, none of which can be supported scientifically. In order to support their arguments, there has been a pattern of data manipulation in a highly unscientific attempt to confirm the anthropogenic (man-made) warming theory.

The four cornerstones of the of the IPCC global warming hypothesis are:

1. Carbon Dioxide, the most important anthropogenic greenhouse gas, increased markedly as a result of human activities, and its atmospheric concentration of 379 ppmv (parts per million by volume) in 2005 far exceeded the natural range of 180 to 300 ppmv over the last 650,000 years.

This conclusion is based entirely on proxy ice core data from Antarctica with monotonously low CO<sub>2</sub> proxy values. The most striking relationship is the drop in CO<sub>2</sub>

proxy values with depth. The burial pressure range of the ice cores is from 5 bars to 15 bars or 5-15 atmospheres, a maximum of about 220 psi. It appears that decompression results in CO<sub>2</sub> depletion. Nevertheless, this rather invariant proxy data was inappropriately linked to observational data from the Mauna Loa Observatory in Hawaii. The result is a flat historic graph melded with the modern data scaled to provide a dramatic right angle and near vertical climb in modern CO<sub>2</sub> values.

The curve is visually dramatic but conceals an unacknowledged change of age. The youngest proxy from the Siple Ice Core is 1890 with a value of 328 ppmv but the entire data set was arbitrarily moved to fit Mauna Loa data for 1973. This appears to have been done to conceal an inconveniently high pre-industrial value for CO<sub>2</sub> of 328 ppmv.

- 2 Human activities have warmed the climate since 1750.

This is an unwarranted assertion which is not supported by facts.

3. The warmth of the last half-century is unusual. It is the highest in at least the past 1,300 years, and is "very likely" caused by increases in anthropogenic greenhouse gases.

This assertion is based on the infamous Mann hockey stick graph, which has been shown to be totally invalid in a number of scientific papers and by the Wegman Commission of the United States Congress. Notwithstanding the scathing criticism of this work by many authors, it continues in widespread use by the IPCC with minor modification in the 2007 report. The IPCC has been shown to have violated its own rules in its 2007 attempt to rebut criticisms of the "hockey stick". All this to evade acknowledging worldwide evidence of the Little Ice Age, the Medieval Warm Period, and the Roman Warm Period. Both of the latter periods of warming had temperatures greater than our present warming. This was brilliantly documented by H.H. Lamb in the late 1960s but, as is characteristic of IPCC, inconvenient evidence is simply ignored, manipulated, or evaded.

4. Predictions are made that anthropogenic warming will continue for centuries, and that by the end of the



21st century the global surface temperature will increase 1.1 to 6.4 °C. Various global catastrophes are prophesied as a result of warming if manmade emissions are not curbed by drastic political and economic decisions.

The obvious beneficial effects of warming for both man and the entire biosphere are discounted. This is a curious omission when discussing a complex society living in what may be the last portion of an interglacial warm period. Cooling will initiate far more serious hazards to our civilization as anyone, who has considered the effects of minor cooling during the Little Ice Age, would know. Glacial onset would result in the loss of major northern croplands, including the breadbasket of the northern hemisphere, and eventually Canada would exist (once again) only as an ice-sheet.

Most of the statements from the SPM are unproven assumptions and a review of the literature on the basis of a truly multidisciplinary approach involving physics, geology, history, and archaeology leads to much different conclusions. It is disheartening to find that the geological profession, which certainly has the basic tools and knowledge to understand that climate has always varied on all time scales, can not reach a sound scientific position on this subject. In particular, it is regrettable that AAPG vacillated and backed off their original 1999 position of opposing the theory of Anthropogenic Global Warming. This resulted from a failure to find a consensus position among their membership. That may be democracy but it is not science. Conducting a survey of people's opinions does not provide a scientific conclusion – on this basis, the sun would still be revolving around a flat world.

In the hope of stimulating some informed scientific debate on the subject, we plan to review the evidence set forth for the four IPCC propositions in a series of forthcoming articles, each considering what the science really shows. Certainly, what we have in scientific terms does not support the drastic actions now being considered by our politicians. Among all the potential hazards facing humankind, warming is the most benign compared to other potential disasters such as super-volcanic eruptions, asteroid collisions, or more likely, a new ice age. In the long term, the failure to challenge the so-called consensus will be detrimental to scientists and our future ability to legitimately influence public policy.

#### REFERENCES:

IPCC. 2001. *Climate Change – The IPCC Scientific Assessment*. Cambridge University Press, Cambridge.

IPCC. 2007. *Climate Change: The Physical Science Basis, Summary for Policymakers. Fourth Assessment Report, Intergovernmental Panel on Climate Change, Geneva, Switzerland.*

Jaworowski, Z. 2007. *The Greatest Scientific Scandal of Our Time*, EIR Science, March, 2007. p. 38-53.

Lamb, H. H. 1965. *The Early Medieval Warm Epoch and its Sequel*. *Palaeogeography, Palaeoclimatology, Palaeoecology*. p. 13-37

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# CLIMATE CHANGE II:

## *The World's Historic Climate*

by Dr. A. Neil Hutton

Hubert H. Lamb was regarded as one of the greatest climatologists of his time with a list of over 150 publications between 1939 and 1995. He was instrumental in establishing the Climatic Research Unit at the University of East Anglia. Perhaps more than any other scientist, he convinced the world of the inconstancy of present climate. Furthermore, he utilized a broad range of observations from economic, botanical, archaeological, agricultural, and historical data in order to establish climatic history. In 1990 the Intergovernmental Panel on Climate Change (IPCC) published their then understanding of global climatic variability in the last 1,000 years which is illustrated in Figure 2.1.

This figure was based on Lamb's pioneering work and quite clearly shows medieval temperatures higher than our present maxima during 1998, thus denying the claim that the warming of the 20th Century was greater than at any time in the last millennium. So what scientific evidence did Lamb have to actually provide an estimate of temperature? Lamb has documented that there was a commercial wine-making industry in the South of England between 1100 to about 1300 that was competitive with producers in France. This represents a northward latitude shift of 500 km from the current grape-growing areas of France and Germany, indicating average temperatures 1.0 °C warmer than in the past decades. In Germany, during this warm period, vineyards were found at higher elevations, about 780 meters above sea level. Today the maximum elevation is about 560 m. Assuming a temperature gradient of 0.6-0.7 °C per 100 meters, then the average mean temperature then was 1.0-1.4 °C warmer than our 20th and 21st Century maxima. This is quantifiable information since we know the climatic requirements for viticulture.

Lamb also observed and documented a descent of the tree line in the Alps by 70-300m. The evidence being the presence of older peat deposits and forest remains at higher elevations. A drop of the tree line of 100-200m occurred in Northern Germany while Iceland experienced a 300m drop to present levels and once-productive farms were covered by advancing glaciers. So severe was the climatic change experienced by Icelanders that Denmark considered evacuating all the islanders and settling them in Europe.

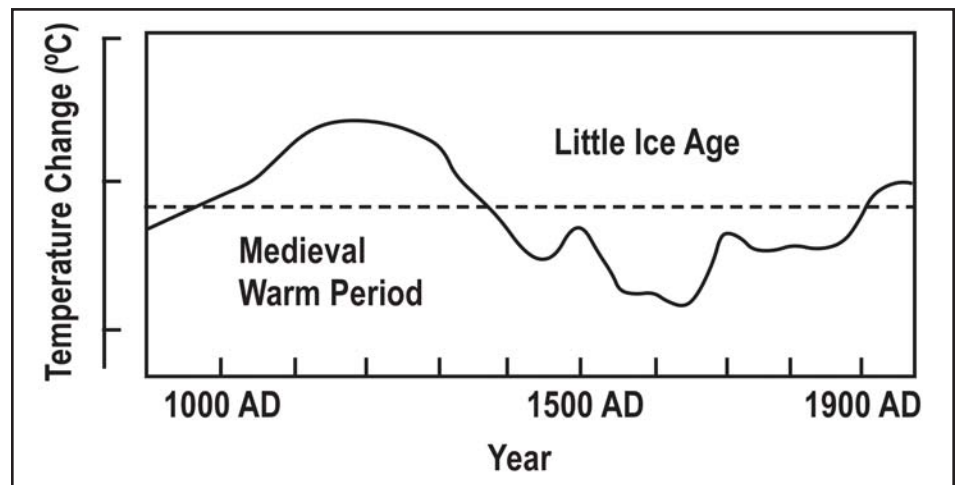


Figure 2.1. This figure was published without attribution by the IPCC in their 1990 report as figure 7c, but it is clear that it was based on the work of Lamb 1965 (see McIntyre, 2008 Climate Audit May 9th 2008).

Lamb used a variety of indicators to develop a temperature profile, such as economic values of produce, winter severity recorded in historical records, agricultural productivity, changes in crop type, distribution, and other factors as discussed. Lamb produced a brilliantly detailed account of European and north Atlantic climate that

demonstrated distinct climatic variability with the Medieval Warm Period warmer than our 20th Century Warm Period and separated from it by the Little Ice Age. During the Little Ice Age, the River Thames froze 40 times, with the greatest frequency occurring during the seventeenth and eighteenth centuries as shown in Figure 2.2. This was no skim of ice

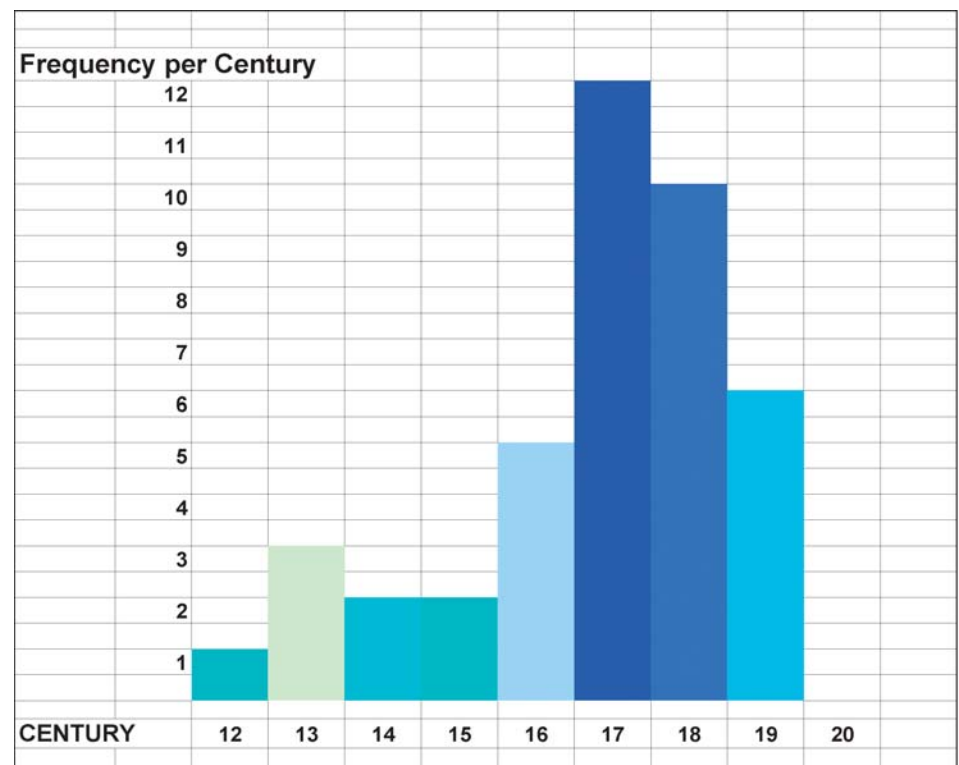


Figure 2.2. The frequency of freezing of the River Thames during The Little Ice Age with the maxima occurring during the 17th and 18th Centuries.



on the surface of the river but was sufficient to support the hauliers and their teams of horses and wagons who preferred to cross directly rather than use the bridges. A team of horses with loaded wagon is in excess of five tons. Accounts indicate that it was so cold that fish became trapped in pools and were frozen into the ice. The citizens of London abandoned the city for the pubs and entertainment on the ice in the legendary Frost Fairs which are delightfully described in Helen Humphrey's book "The Frozen Thames". During this period sea ice was reported impeding coastal traffic and, in 1684-1685, the English Channel was ice-covered from Dover to Calais. At the same period, Iceland was totally surrounded by sea ice as far as the eye could see from the highest mountains. Similarly, the freezing of the Baltic was such that people traveled by sleigh from Sweden to Poland. These events which are extensively reported in historical documents have been criticized as being anecdotal and not providing an accurate measure of temperature variation and without global significance. However they appear to provide a better evaluation of historic climate than tree rings.

Since the documentation of the Little Ice Age, (LIA) and the Medieval Warm Period, (MWP) was dropped by the IPCC in 2001, there has been an avalanche of papers from around the world documenting the occurrence of the MWP and the LIA. There are some 500 citations from around the world. Repeatedly

these publications cite the average temperature of the MWP as up to 1°C warmer than the present warm period. An excellent citation index is available from CO<sub>2</sub> Science which is available at [www.co2science.org](http://www.co2science.org) for both the MWP and LIA.

Notwithstanding this body of evidence, in 2001 the IPCC in their Third Assessment Report (TAR-2001) published a diagram purporting to represent Global Surface temperature for the last millennium (Figure 2.3) based on tree-ring data. The diagram shows a flat and slightly cooling linear trend until 1900 when, in a brilliant visual stroke, Mann compared his apples to oranges by grafting on the actual surface temperature record for the 20th Century, "the blade", on to the nine centuries of proxy tree-ring data, "the handle". This has since been derisively named the "Mann Hockey Stick" and became the clarion call of the IPCC and the green lobby claiming that 1990 was the hottest decade and 1998 the hottest year of the millennium. This scientific travesty was published in a peer-reviewed journal, yet none of the obvious problems were questioned until a publication by McIntyre and McKittrick in 2003. Only by great persistence and perseverance did they obtain the data. Their conclusion: "the particular "hockey stick" shape derived in the Mann, Bradley, and Hughes (1998) proxy construction – a temperature index that decreases slightly between the early 15th century and early 20th century and increases

dramatically up to 1980 – is primarily an artifact of poor data handling, obsolete data, and incorrect calculation of principal components."

Nevertheless, IPCC continued to use this diagram in their literature while in the US National Assessment (2000) the diagram lost its error bars and was promoted from a Northern Hemisphere indicator to Global stature. The National Academy of Sciences (NAS 2006) also used the Mann hockey stick, notwithstanding the damning criticism of McIntyre and McKittrick. The spin continued until the Energy and Commerce Committee of the United States Congress requested an independent review. This resulted in the establishment of the Wegman committee (2006), an independent group of scientists with statistical expertise working pro bono. They concluded decisively that the statements of Mann, Bradley, and Hughes (1998), which indicated that the 1990s was the hottest decade in a millennium and that 1998 was the hottest year of the millennium cannot be supported. Although the "hockey stick" was dropped from the IPCC Fourth Assessment in 2007, the authors simply ignored the well documented historical data demonstrating several cycles of warming and cooling (Figure 2.1), to save the embarrassment of a nearly flat-line proxy CO<sub>2</sub> curve from ice core data covering the same period. Either the CO<sub>2</sub> proxies are wrong or CO<sub>2</sub> is not a significant driver of the earth's climate. In reality, this can only be seen as a deliberate evasion of the fact that climate variability has occurred for millennia with temperature fluctuations of similar magnitude to those occurring at present.

Instead, the IPCC authors took the political way out, and in the IPCC 2007 Fourth Assessment they simply removed the historical data and presented truncated data commencing in 1850 so that all that remains is the warming as the climate recovers from the maximum cooling in the LIA. For this completely unscientific manipulation they received the Nobel Prize.

As an aside, given the common emphasis on peer review, one might wonder how such a poor scientific product as the Mann, Bradley, and Hughes (1998) study was originally published, given its defective statistics that contradicted everything that was known about historic climate and, yet, was still accepted by IPCC for the Third Assessment Report in 2001. The Wegman Committee did address this issue and concluded that within the paleoclimate community there are several intensively coupled groups or cliques – meaning that every member of the group has one or more coauthor relationships with every other member of the group, which

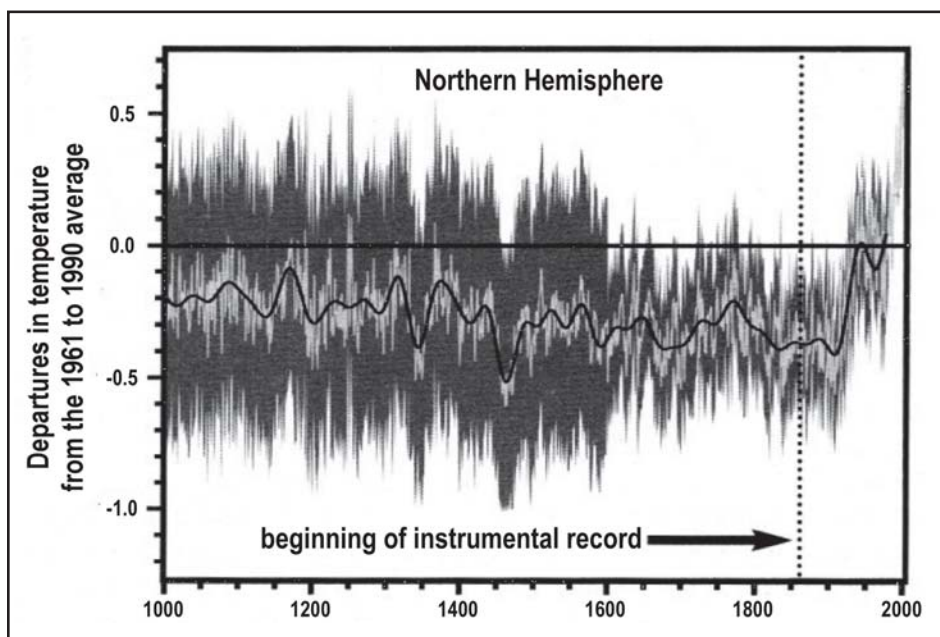


Figure 2.3. The Infamous Hockey Stick of Mann, Bradley, and Hughes. Note that this figure obliterates the Medieval Warm Period and the Little Ice Age. The graph is not temperature but the deviations from the 1961 to 1990 average. The smooth line is a 50-year moving average and the dark grey error bars represent 95% confidence limits. Note high levels of uncertainty at periods earlier than 17th Century. After 2001 UN IPCC, Summary for Policymakers, p. 3.

suggests that the peer-review process failed to fully vet papers before they were published. In turn, the peer-review process may result in censorship where the views expressed are contrary to the views or the agenda of the clique. Mann, Bradley, and Hughes presented what the climatological community wanted to hear and so they ignored all previously published data on climate variability.

The IPCC has relied principally on the average global surface temperature to support their claim of anthropogenic global warming (AGW); however, warming in itself is not proof of the cause. Claims that AGW is occurring that are backed by accounts of melting glaciers and disappearing Arctic sea ice are simply confusing the consequences of warming with the causes. The question is how much of the warming can be linked to increases in greenhouse gases.

There is a well founded concern that the surface temperature record is seriously contaminated by the urban heat island effect. Therefore, rural stations are crucial to develop a baseline in order to remove the effects of urbanization. But the number of true rural stations is small, accounting for only 7% of the earth's area. A recent survey of the US Climate Reference Network (USCRN) shows that only 4 % of the stations have appropriate recording conditions with sensors located at least 100 meters from artificial heating or reflecting surfaces and parking lots. An amazing 70% are located within 10 meters of, or adjacent to, or on top of an artificial heating source such as a building, roof top, parking lot, air conditioning exhaust, or concrete surfaces. (See: <http://wattsupwiththat.com/>) These problems are not confined to the US, the Goddard Institute for Space Studies (GISS) includes temperature stations in Canada that do not meet the required siting specifications. The City Centre Airport in Edmonton is a good example which clearly demonstrates the effect of urban heat island effects and there are many more.

The direct relationship between population growth and temperature increase is well documented as shown in Figure 2.4 showing the mean annual air temperature in Phoenix Arizona. The coincidence of the population growth with temperature increase is striking. While in Figure 2.5 data from 93 climate stations in California is presented by county population. Where the population is over one million, the mean annual air temperature shows an increase of almost 3 °F, while in counties with a population less than 10,000 the temperature increase is only 0.25 °F and, even in the latter case, it is likely that the temperature stations have been affected by urban construction.

The last three decades of the 20th century have been a period of vigorous economic growth and construction and expansion coinciding with the growth in the global average temperature (McKittrick and Michaels, 2007). Meanwhile, the geographic distribution and sampling has deteriorated over time, especially since the 1970s. Ideally, coverage should provide some 2,592 grid boxes at five degrees of latitude and longitude but with the decline in stations the coverage has dropped from 1,200 to 600 stations – a decline in grid station coverage from 46 to 23%! The majority of the remaining stations tend to be located in more populated areas. Nevertheless, the IPCC claims that their global average surface temperature has been deurbanized, but they have declined to release the data or methodology so that it can be independently verified. Dr. Jones of the Climate Research Unit (CRU) at the University of East Anglia famously responded to a request for the basic data and methodology with, "Why should I make the data available to you, when your aim is to find something wrong with it." This does not suggest that the CRU have high confidence in

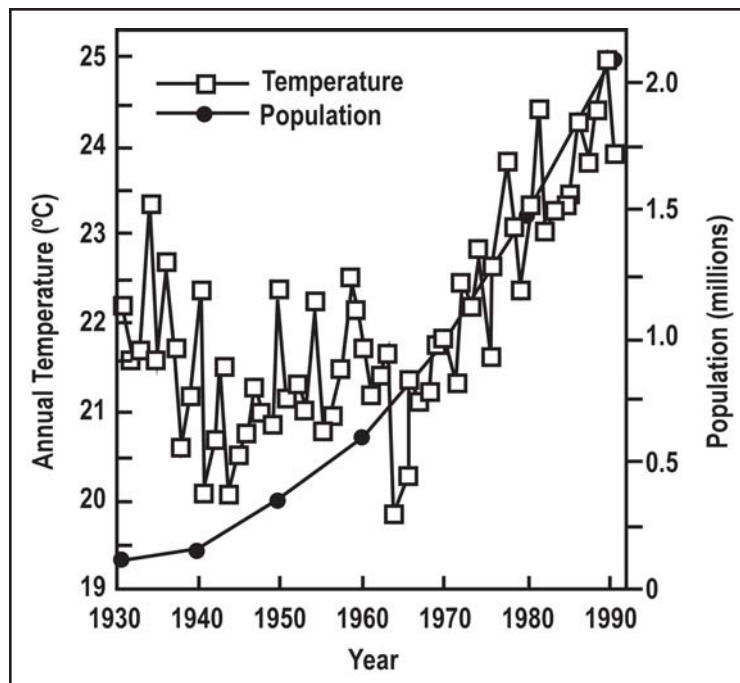


Figure 2.4. Mean annual air temperature in Phoenix, Arizona, from 1931 to 1990 and population growth for the Phoenix metropolitan Area Source: After Balling, 1992.

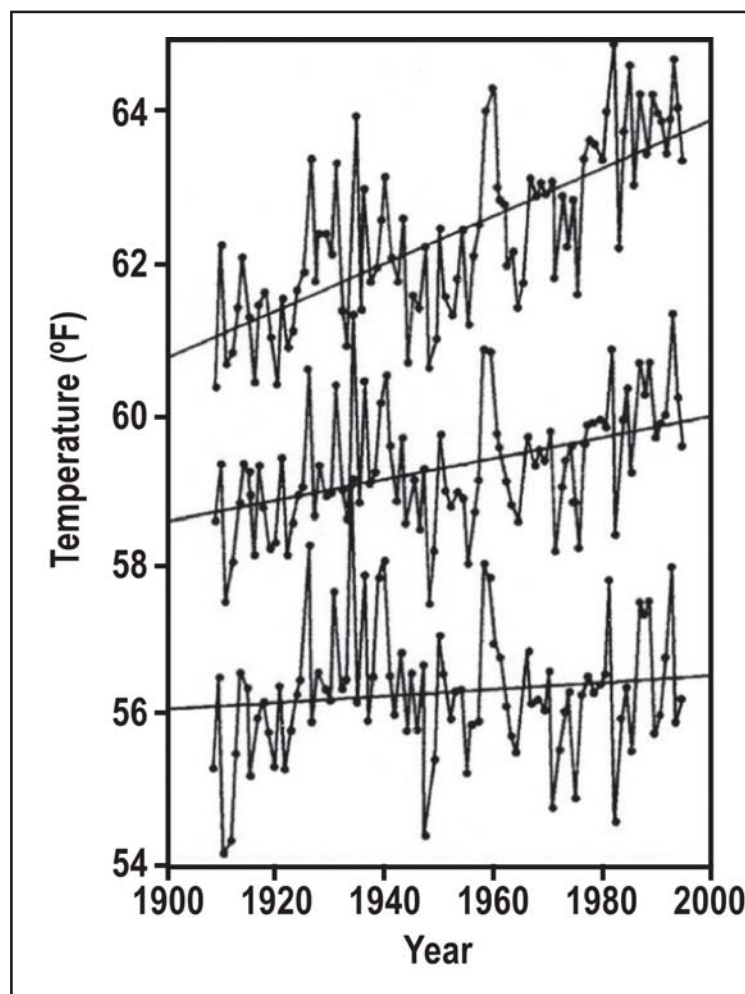


Figure 2.5. Average annual air temperatures at 93 California climate stations from 1947 to 1993 stratified by 1990 county population: over 1 million (top); between 1 million and 100,000 (middle); and less than 100,000 (bottom). Source: Goodridge, 1996.



their work or of their contribution to the IPCC. This also confirms Stephen McIntyre's point that there is greater due diligence done on small public offerings on the TSX than there has been on Climate Science where the IPCC proposals could cost billions. The Wegman Committee similarly concluded that, where massive amounts of public monies and human lives are at stake, academic work should have a greater level of scrutiny and review.

Temperatures over the ocean are not taken by thermometers in the air two meters above the surface, but by taking the temperature of the sea water itself, the so-called sea surface temperature. (SST) Several different methods have been used to measure SST, although currently this is done mainly by buoys and satellites. In the past, temperatures have been taken from a variety of depths from one mm (satellites) to two meters (ship engine water intakes) which may not reflect air temperature because of variable ocean currents temperatures and prevailing wind systems.

The merit of calculating global average surface temperature has been questioned since there is not one global climate but a large variety of climates depending on latitude, geographic distribution of land masses, and atmospheric dynamics. Weather is not about homogeneities but differences. It is the redistribution of heat that generates weather and climate. As an example, 1947 was the coldest year in the UK since records have been kept but appears as one of the warmest years in global records. Much has been made of the potential loss of the Greenland ice cap which may cause widespread sea level rise; however, temperature records on Eastern and Western Greenland and adjacent eastern Canada show significant cooling since 1960. (Rogers, 1989 and Morgan et al., 1993).

The IPCC has depended almost exclusively on the rise in Global Average Surface Temperature as proof of anthropogenic global warming (AGW). The AGW hypothesis proposes that 'greenhouse' gases trap heat in the upper atmosphere. The general circulation models supporting this hypothesis show an increasing warming trend with altitude, peaking at roughly two times the surface value at around ten kilometers. Therefore, the diagnostic test of the validity of AGW theory is to actually measure the temperature increase at 8-10 km in the troposphere. Such measurements have actually been taken in the troposphere for the last 50 years, from 1957 to 1980, by radiosonde balloons, and since 1980 by Microwave Sounder Units (MSU) onboard NASA satellites. The accuracy and

compatibility of the MSU data has been validated independently by measurements from radiosonde balloons. The MSU data provides excellent global coverage and a high degree of accuracy but it shows no meaningful warming trend as shown in Figure 2.6. Therefore, the AGW hypothesis is shown to be incorrect by the satellite records. In scientific terms, the hypothesis fails.

Finally, the recent reports from the world's temperature monitoring stations, the UK's Hadley Centre and in the US, NASA's GISS, UAH, and RISS all show that in the last year, from January 2007 to January 2008, the global average temperature has dropped considerably. The cooling ranges from 0.65-0.75 °C (Figure 2.6), which is the largest single drop ever recorded. Furthermore, the Secretary General of the World Meteorological Society, Michael Jarraud, has agreed that temperatures have dropped and will continue to do so through 2008. The cooling is attributed to La Nina although this was never factored into any of the climate model predictions of the IPCC in any of their assessment reports (1990, 1995, 2001, and 2007). Moreover in the IPCC 2007, "Summary For Policymakers", it was claimed that average Northern Hemisphere temperatures during the second half of the 20th Century were *very likely* (their italics) greater than in any other 50-year period in the last 500 years and *likely* (their italics) the highest in the last 1,300 years. The detailed work of Hubert Lamb shows that this is simply incorrect. The Mann "Hockey Stick" incident shows a level of desperation to establish the link to AGW and the failure to acknowledge this in IPCC 2007 reports indicates that we are no longer dealing with science but the politics of a belief system.

In conclusion, we can say that the World's Historic Climate has well documented pronounced cycles of warming and cooling occurring independent of CO<sub>2</sub> levels in the atmosphere. Only in the last century can a possible link be established to CO<sub>2</sub> when its production has increased since the industrial revolution. However, even then, the correlation of atmospheric CO<sub>2</sub> with global average surface temperature is relatively poor. The rebound of temperature from the Little Ice Age to the average temperature highs of the 1930s and 1940s occurs when CO<sub>2</sub> values lie between 290 to 310 ppmv but cooling occurred while CO<sub>2</sub> increased from 310 to 330 ppmv from the 1950s to the early 1970s. The only direct correlation occurs in the period from 1975 to 1998 when CO<sub>2</sub> increased from 330 to 365 ppmv (Figure 2.7). While the CO<sub>2</sub> content continues to increase, there has been no increase in temperature this century (see Figure 2.6). Therefore, a relationship between global

average surface temperature and CO<sub>2</sub> content can only be demonstrated for the period from 1975 to 1998. This has no statistical significance on the millennial scale of climate. Furthermore, there is very good reason to suggest that a significant part of the average temperature increase is related to the urban heat island effect. Since surface warming in itself is not proof of Anthropogenic Global Warming, and there is a failure to observe any significant warming of the troposphere, then there is clear evidence that the AGW hypothesis is wrong.

Finally it is clear that in the 2007 IPCC reports, all scientific objectivity has been abandoned in order to establish the authors' political objectives. Unfortunately they have been rather successful since the media are quite happy to go along with the unsupported scientific conclusions and appear to be blind to the unprincipled distortion of the evidence.

## REFERENCES

- Carter, R. M. 2007. *The Myth of Human Caused Climate Change. The AusIMM New Leaders Conference. Brisbane, QLD, May 2-3.*
- Balling, R. C. Jr. 1992. *The Heated Debate: Greenhouse Predictions Versus Climate Reality. San Francisco, Pacific Research Institute for Public Policy.*
- Goodridge, J. D. 1996. *Comments on Regional Simulations of Greenhouse Warming including National Variability. Bulletin American Meteorological Society, v. 77, p. 3-4.*
- Humphreys, Helen. 2007. *The Frozen Thames. McLelland and Stewart, Toronto.*
- IPCC. 1990. *Climate Change: The IPCC Scientific Assessment. Cambridge University Press, Cambridge.*
- IPCC. 2001. *Climate Change 2001: The Scientific Basis. Cambridge University Press, Cambridge.*
- IPCC. 2007. *Climate Change: The Physical Science Basis, Summary for Policymakers. Fourth Assessment report, Intergovernmental Panel on Climate Change. Geneva, Switzerland.*
- Lamb, H. H. 1965. *The Early Medieval Warm Epoch and Its Sequel. Palaeogeography, Palaeoclimatology, Palaeoecology, v. 1, p. 13-37.*
- Lamb, H. H. 1967. *Britain's Changing Climate. Geographical Journal, v. 133, p. 445-468.*
- Lamb, H. H. 1977. *Climate – Present Past and Future. Volume 2, Climatic History and Future. Methuen, London.*
- Mann, M. E., Bradley, R. S., and Hughes, M. K. 1998. *Global scale temperature patterns and*





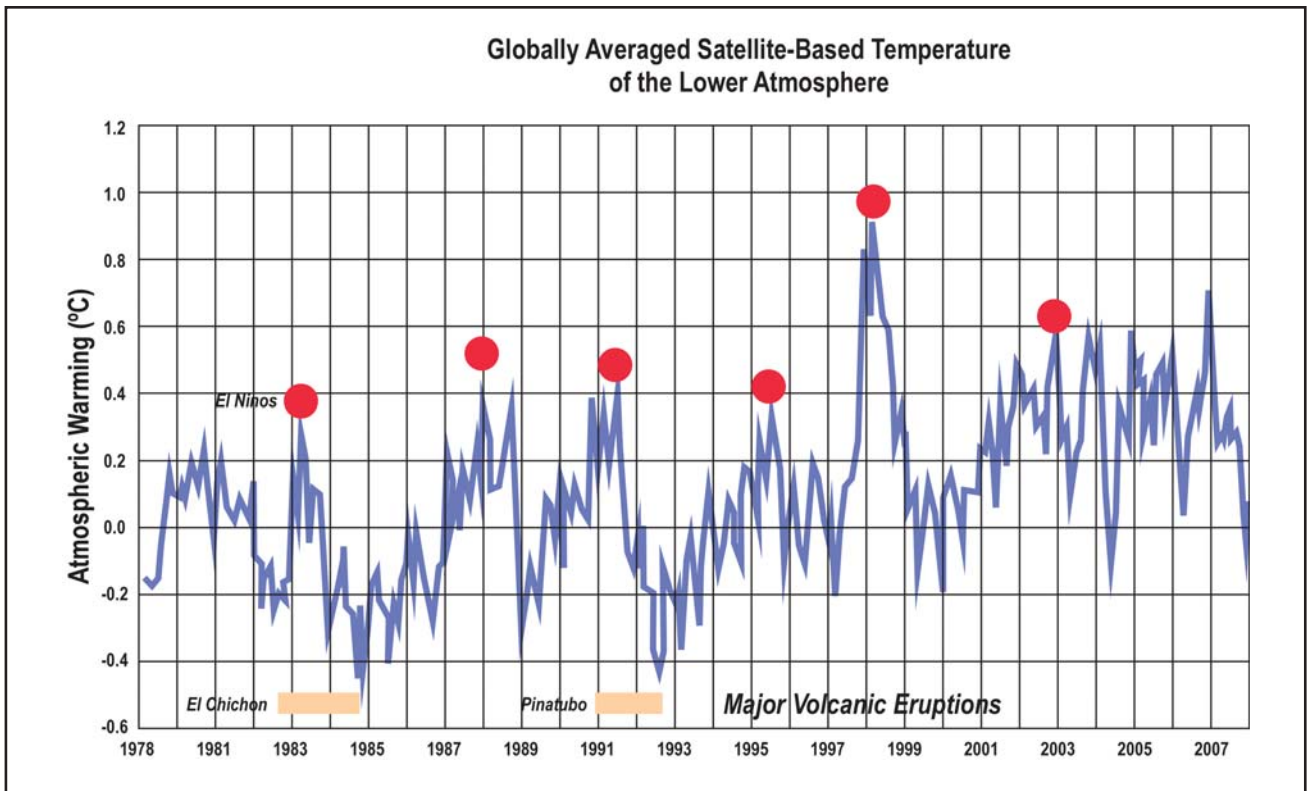


Figure 2.6. NASA Satellite Data. Lower tropospheric temperature since 1978 measured by microwave sounding units. Note the lack of any clearly defined warming trend. The record is dominated by the Pacific Decadal Oscillations of El Nino / La Nina together with cooling resulting from major volcanic eruptions. The plunge in temperature from January 2007 to January 2008 of 0.7 °C has been attributed to La Nina. Thus if CO<sub>2</sub> has any effect at all it is quite insignificant in respect to other climate drivers.

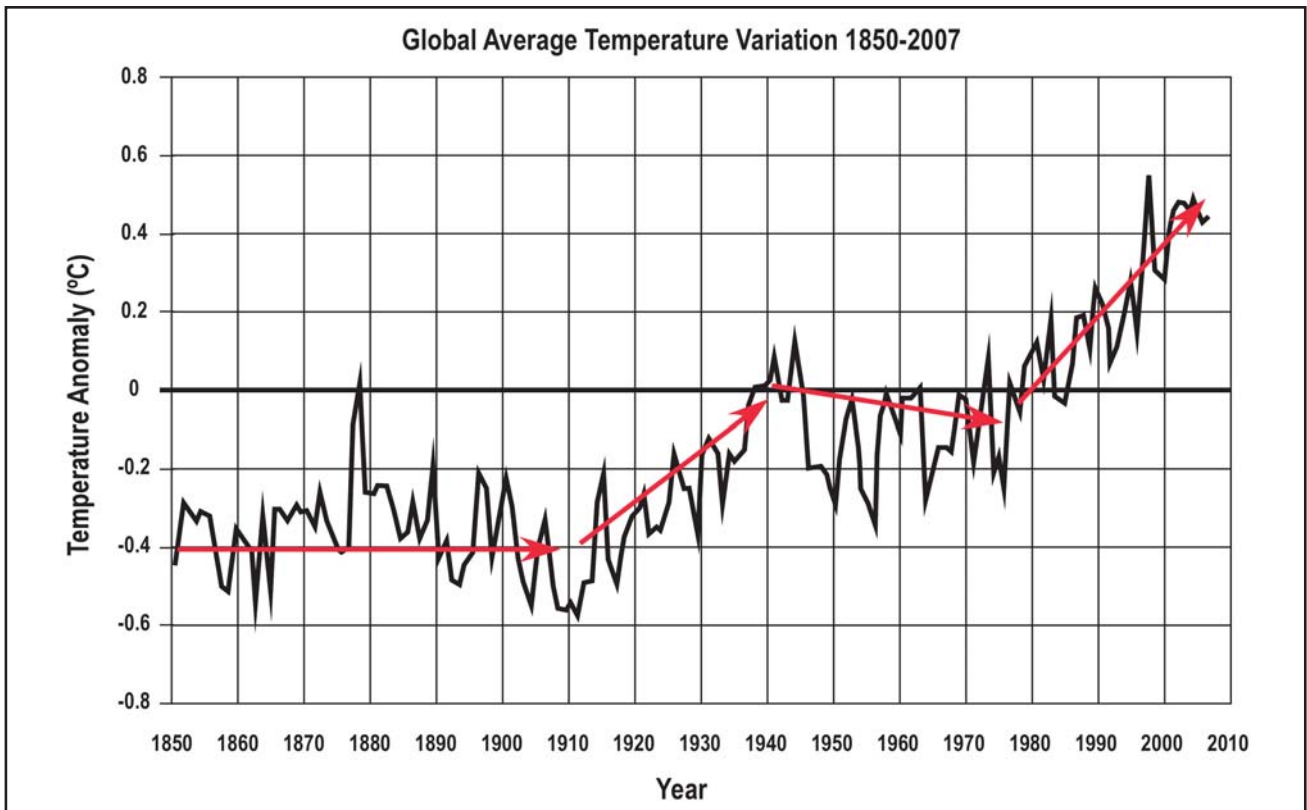


Figure 2.7. Globally averaged temperature variations between 1850 and 2007. The temperature increase to the 1940s reflects natural rebound of temperature from the Little Ice Age independent of CO<sub>2</sub>. The cooling from 1940 to 1970 occurs while CO<sub>2</sub> is increasing and the only correlation with rising CO<sub>2</sub> is from 1980 to 1998. Although CO<sub>2</sub> continues to increase global temperatures have shown no warming in the last ten years. Source: HadCRUT3 dataset from the UK Met Office and U. of East Anglia.



climate forcing over the past six centuries. *Nature*, v. 392, p. 779.

McIntyre, S. and McKittrick, R. 2003. Corrections to the Mann et al. (1998) Proxy Data Base and Northern Hemispheric Average Temperature Series. *Energy and Environment*, v. 14, no. 6, p. 751-771.

McKittrick, R. and Michaels P. 2007. Quantifying the influence of anthropogenic surface processes and inhomogeneities on gridded global climate data. *Journal of Geophysical Research*, v. 112, D24S09.

Morgan, M. R. et al. 1993. Temperature trends at Coastal Stations in Eastern Canada. *Climatology Bulletin*, v. 27 no. 3.

NAS. 2006. *Surface Temperature Reconstruction for the Last 2,000 Years*. National Academy Press, Washington DC.

National Assessment Synthesis Team (NAST). 2000. *Climate Change Impacts on the United States: The Potential Consequence of Climate Variability and Change*. Overview Document, USGCRP, June 2000.

Rogers, J. C. 1989. Seasonal Temperature Variability over the North Atlantic Arctic. 13th Annual Climate Diagnostics Workshop. NOAA/NWS, p. 170-178.

Wegman, E. J. et al. 2006. Ad Hoc Committee Report on the 'Hockey Stick' Global Climate Reconstruction. Report presented to the U.S. House of Representatives, Committee on Energy and Commerce, July 14 2006. [www.uoguelph.ca/cmckitirilresearch/WegmanReport.pdf](http://www.uoguelph.ca/cmckitirilresearch/WegmanReport.pdf).

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# CLIMATE CHANGE III:

## *Carbon Dioxide*

by Dr. A. Neil Hutton

It is curious that this gas, which is the fundamental building block of life, has become vilified as the culprit of an impending Climate Catastrophe. With visual media, at this point, on screen would appear a nest of stacks belching forth great plumes of "pollution." The fact that this is mainly water vapour, the Earth's primary "greenhouse gas" responsible for somewhere between 85-95% of atmospheric warming is never acknowledged.

What do we really know about CO<sub>2</sub>? From my experience, the general public is poorly informed. When asked to specify the content of CO<sub>2</sub> in the atmosphere, and given a choice of 37.9%, 3.79%, or 0.0379% the great majority opts for one of the first two values. However carbon dioxide is a trace gas representing less than 1% of the atmosphere, currently 379 parts per million by volume (ppmv). To put this in perspective, only 38 out of every 100,000 molecules of air are carbon dioxide. Then consider that it takes up to five years of emissions created by humans to add 1 molecule to every 100,000 molecules. Moreover, in the media and other reports, it is commonplace to read that humans emit 14.5 gigatons (GT) of CO<sub>2</sub> annually. This sounds enormous, but it is never stated that this represents only 1.25 parts per million by volume annually of the total atmosphere.

To provide some perspective on the numbers, it is useful to compare the relative amounts of carbon contained globally in the atmosphere, the surface, and the oceans. The atmosphere contains 750 GT C, vegetation soils and detritus contain 2,200 GT C, the surface ocean contains 1,000 GT C, and the intermediate and deep ocean contain 38,000 GT C. (Schimmel, 1995) These amounts, of course, are not fixed and static as there is a continuous exchange between these global carbon reservoirs. Thus it is estimated that each year the atmosphere and the surface ocean exchange 90 GT C; vegetation and the atmosphere, 60 GT C; marine biota and the surface ocean, 50 GT C; and the surface ocean and the intermediate and deep oceans, 100 GT C. (Schimmel, 1995). Therefore the human

contribution of 5.5 GT C represents only a very small amount within the totality of the carbon cycle. However, it is the annual increase of 3 GT of carbon annually which drives the hypothesis of anthropogenic global warming (AGW).

Carbon dioxide is significantly denser than the other elements of air. It is almost 60% denser than nitrogen and 40% denser than oxygen. Happily, gases do not segregate gravitationally, otherwise we would all suffocate in a layer of CO<sub>2</sub> some 400 to 500 meters thick. Molecular activity in gases known as Brownian Motion causes rapid diffusion and mixing of the different molecular components. This is also aided by convection as well as global atmospheric circulation such that the components of the air are relatively constant globally. There are variations regionally and – especially in the southern hemisphere – where some fluctuations are attributed in part to La Nina and El Nino events, but the variation amounts to only a few parts per million by volume. In general, the southern hemisphere stations have values about 5 ppmv lower than in the northern hemisphere.

As a medium to warm the atmosphere, CO<sub>2</sub> seems like a very poor candidate. First, because it is a trace gas forming less than .0379 % by volume of the atmosphere and, second, because it's thermal conductivity is extremely low. Thermal conductivity is a property which measures how much heat per time unit and temperature difference flows in a medium. Most gases have such low conductivity values that they are excellent insulators in the absence of convection. The conductivity of CO<sub>2</sub> (0.009) is less than half that of air (0.024), and it is only 15% of the conductivity of water (0.058). Comparatively then, the capacity of CO<sub>2</sub> to warm the atmosphere conductively is negligible. Furthermore, examining the isochoric thermal diffusivity (a measure of how rapidly a temperature change will spread) demonstrates that doubling of CO<sub>2</sub> has a negligible effect. Based on these fundamental physical attributes, CO<sub>2</sub> can not be the vehicle of atmospheric warming. (Gerlich and Tschuschner, 2007.)

This, then, leaves only radiation heat transfer as the principal vehicle for atmospheric warming by CO<sub>2</sub>. Radiation heat transfer occurs as a result of the exchange of thermal radiation energy between two or more bodies that arises as a result of a temperature difference. No medium need exist between the two bodies for heat transfer to take place, since Photons traveling at the speed of light are the intermediaries of the electromagnetic radiation with a wavelength range of 0.1 to 100 microns, encompassing the visible light spectrum. Atmospheric warming is believed to occur as a result of the fact that the atmosphere is essentially transparent to short wave radiation in the visible light spectrum – 0.38 to 0.75 microns. However, global warming theory suggests that long-wave infrared radiation is preferentially absorbed by certain gases in the atmosphere, which causes it to warm. The principal atmospheric gas causing warming is water vapour and cloud with 85-95% of the warming attributed to it. The other gases in order of relative importance are carbon dioxide, methane, nitrous oxide, and ozone.

However, carbon dioxide has been identified in the global warming hypothesis as having the fundamental characteristics of absorption and emission of infrared radiation (IR) and, as a result, it is claimed that it is a potential driver of global climate. The carbon dioxide molecules do not have a simple single response to IR radiation. Four modes of molecular vibration, or spin occur in response to photon stimulation. Carbon dioxide is a linear molecule with the carbon atom situated in line between two oxygen atoms. The linear molecular structure allows a vibrational response in which the carbon atom oscillates between the oxygen atoms. This particular response has the ability not only to absorb infrared radiation but also to emit radiation; however, only some 5% of molecules actually radiate at room temperatures. The ability of CO<sub>2</sub> to radiate has been utilized in the development of lasers and in the thermodynamics of combustion chambers but this quantum state depends on elevated temperatures and electro-



magnetic stimulation. Alfred Schack, a pioneer in industrial thermodynamics, as early as 1972 indicated that the radiative heat transfer capabilities of CO<sub>2</sub> at atmospheric temperatures were negligible. The other quantum states of CO<sub>2</sub> are capable of absorbing infrared but do not radiate. Carbon dioxide absorption of IR radiation occurs in four narrow bands at 2, 3, 5, and 13-17 microns. CO<sub>2</sub> occupies only about 8% of the infrared band and, given its levels as a trace gas, does not in itself have the capacity to change the climate. This point is, in fact, conceded by climatologists but they rely on the concept of feedbacks to amplify the effect. Feedbacks are unproven assumptions that the warming by CO<sub>2</sub> will cause changes in clouds, water vapour, and precipitation systems amplifying the warming. The positive feedback assumptions have been incorporated into climate models which are typically the major basis for global warming predictions. All leading climate models forecast that warming by increasing CO<sub>2</sub> would cause an increase in cloud, especially high altitude cirrus clouds, which would then amplify the warming. A recent publication by Spencer et al. (2007) has shown these assumptions to be incorrect. In fact the feedback is negative so that as the tropical atmosphere (of the study area) warms, cirrus clouds decrease. That allows more infrared heat to escape from the atmosphere to outer space.

Because CO<sub>2</sub> absorption occurs over a limited range of the IR spectrum it is generally accepted that 99% of the radiation in the CO<sub>2</sub> absorption bands is absorbed within only a few tens to hundreds of meters of the source. In other words the absorption capacity of CO<sub>2</sub> is saturated within a few hundred meters above the Earth's surface. Thus doubling of atmospheric CO<sub>2</sub> will reduce the saturation distance, causing only a minor change in temperature. Climatologists accept that the temperature will change by less than 1°C. Nevertheless, as was discussed above, they claim that doubling of CO<sub>2</sub> will trigger positive feedbacks, although – to this date – there is no measurable evidence that this occurs. Currently we are 40% of the way to doubling pre-industrial levels of CO<sub>2</sub>; nevertheless, there has been no warming this century.

If CO<sub>2</sub> is saturated, that is to say incapable of getting any warmer by any further absorption of IR radiation, then how does the warmed gas behave? At this point convective heat transfer will take over and

the gas will rise to be replaced by cooler air molecules. Since carbon dioxide, is to a large extent, a product of combustion its vertical ascent along with water vapour is a common feature of our winter landscape. As the warmed air ascends the pressure drops and the molecules expand, which causes a drop in temperature. When gas is compressed it generates heat, as in the inflation of a tire, and when decompressed it loses heat, the property utilized in snow-making equipment. If the volume remains the same and pressure is decreased, then the temperature will drop, which is the case in the global atmosphere. The determining factor in atmospheric pressure is the mass and weight of the gas in that part of the atmosphere above the point of measurement. Air pressure increases continuously from the top of the atmosphere to the Earth's surface and so does temperature. This behaviour of the atmosphere is described as adiabatic because there is no actual change in heat, but only pressure and temperature. The rate at which temperature changes in the atmosphere is called the lapse rate. The theoretical lapse rate for a dry atmosphere is 9.8°C per kilometer but this is only for extremely dry atmosphere such as in desert and arctic climates. The effect of high humidity and cloud is to reduce the lapse rate to an average of about 6.5°C per kilometer. As a result it is normal to find aircraft cruising at 10,000 meters (32,000 feet) experience air

temperatures of -65°C. Given an average sea level temperature of 15°C the temperature at 2,500 meters altitude is -1.25°C, which is why mountains maintain snow cover and glaciers. This means that some 80% of the lower 20 kilometers of the atmosphere (the troposphere) is between 0 and -65°C. Therefore, in the predominantly subzero temperatures of the troposphere with the atmospheric pressure progressively diminished by adiabatic expansion, the kinetic energy of the gases is greatly reduced. As a result, quantum molecular activity causing IR emission is reduced substantially.

Irrespective of the discussion above, the IPCC 2007: Historical Overview of Climate Change (p. 115, Figure 1) suggests that some infrared radiation passes through the atmosphere but most is absorbed and re-emitted in all directions by greenhouse gas molecules and clouds. The effect of this is to warm the Earth's surface and the lower atmosphere. This statement conflicts with the Second Law of Thermodynamics, which indicates that energy will always flow from a higher to a lower energy state. Heat can not flow from a colder body (the atmosphere) to a warmer body (the Earth's surface) without work being applied. This is a fundamental problem with the Global Warming Hypothesis which unaccountably never seems to be challenged. Clouds have the capacity to absorb infrared radiation but their capacity to emit is poor. Even if this

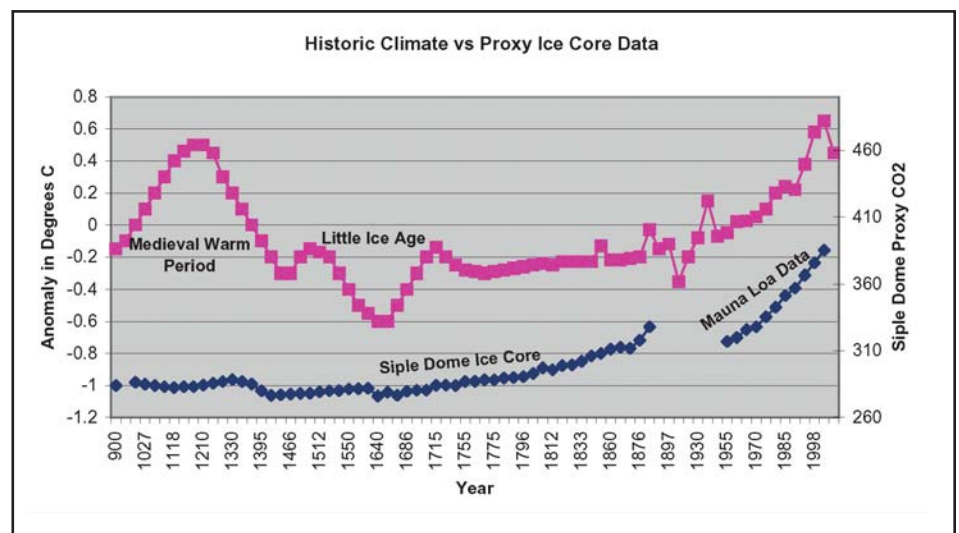


Figure 3.1. This figure is a plot of Historic Climate after Lamb included in the report of the IPCC, 1990 showing the well defined Medieval Warm Period and Little Ice Age. This chart of temperature variation is compared with Proxy CO<sub>2</sub> data from the Siple Dome in Antarctica. What is noteworthy is the complete disconnection between the proxy CO<sub>2</sub> data and climate. Although the ice core proxies are claimed to be a direct measure of atmospheric CO<sub>2</sub>, they do not reflect well established climate trends. The decline of CO<sub>2</sub> proxies is coincident with burial depth and unrelated to climate. This should be compared with the data from Siple Dome Ice Core in IPCC, 2007 Synthesis Report, p. 38, Figure 2.3., in which the horizontal scale has been unduly compressed and the data gap between Siple Dome Proxies and the real CO<sub>2</sub> values from Mauna Loa eliminated.



were not the case, the cooler cloud can not warm the Earth's surface. Clouds generally, and low clouds in particular, cool the surface. A point that is clearly made in the weather records of the Little Ice Age (Lamb, 1965) and more specifically by Svensmark and Friis-Christensen (1997).

IPCC in the May, 2007. "Summary for Policymakers" stated that CO<sub>2</sub> was the most important anthropogenic greenhouse gas, that it had increased markedly as a result of human activities, and that its atmospheric concentration of 379 ppmv in 2005 far exceeded the natural range of 180 to 300 ppmv over the last 650,000 years.

This statement is based on proxy CO<sub>2</sub> concentration data derived from ice cores and is based on the assumption that air inclusions in ice are closed systems permanently preserving the chemical and isotopic composition of the gas. This is one of the cornerstones of the AGW hypothesis. Why should we doubt this particular proposition? First, when examined in detail the CO<sub>2</sub> proxy values are remarkably invariant within a narrow range for a period of 10,000 years, during which the climate oscillated through several well defined warm and cold periods. Unlike most substances, the solubility of CO<sub>2</sub> decreases as temperature increases, thus warm periods will have elevated atmospheric CO<sub>2</sub> values because of degassing of the oceans. In cold periods, like the Little Ice Age, the values should be lower because of increased solubility of CO<sub>2</sub>. As displayed in Figure 3.1, there is no correspondence between the plot of proxy CO<sub>2</sub> values from Siple Dome and the corresponding plot of Historic Temperature published by IPCC (1990) following Lamb (1965) Reproduced in Figure 3.2 is the IPCC (2007) version of the Siple Dome data (IPCC, Summary for Policymakers, p. 3 Figure SPM1). The pronounced hockey stick shape of the curve is due primarily to the intense compression of the horizontal scale which causes the sharp bend and near vertical trajectory where the ice core proxy curve intersects with the actual measurements from Mauna Loa. It also neglects the 83-year gap between the ice cores and modern data (Figure 3.1, lower curve).

The most significant trend in the proxy data at Siple and Taylor Domes in Antarctica is a drop in CO<sub>2</sub> values with depth as shown in Figure 3.1 and Figure 3.3. In both instances there is a nearly linear decline in proxy CO<sub>2</sub> values with depth, which bears no relationship to historic climate.

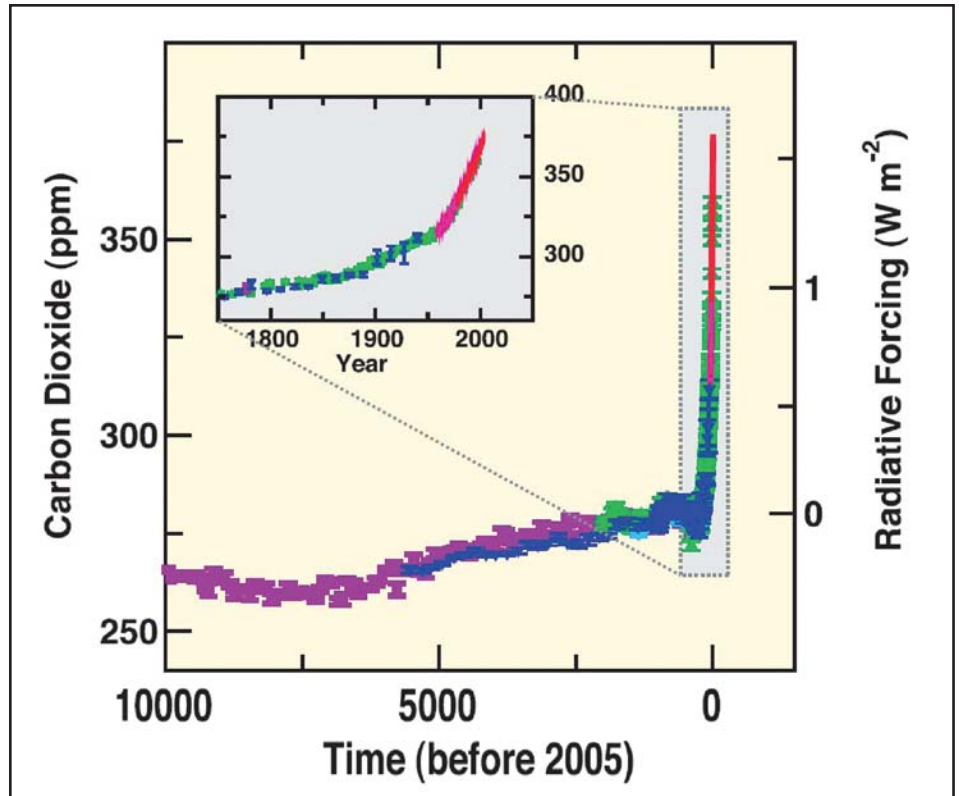


Figure 3.2. The "Hockey Stick Curve for CO<sub>2</sub> from the IPCC, 2007 Synthesis Report p.38, Figure 2.3 also from Siple Dome in Antarctica. Note the monotonous almost flat CO<sub>2</sub> proxy curve for the last 10,000 years, a period, during which, there was significant climatic variation. This suggests that, either the proxy data are wrong, or CO<sub>2</sub> has no effect on climate. Also compare to Figure 3.1 the same data without the manipulation to exaggerate the post industrial increase of CO<sub>2</sub>.

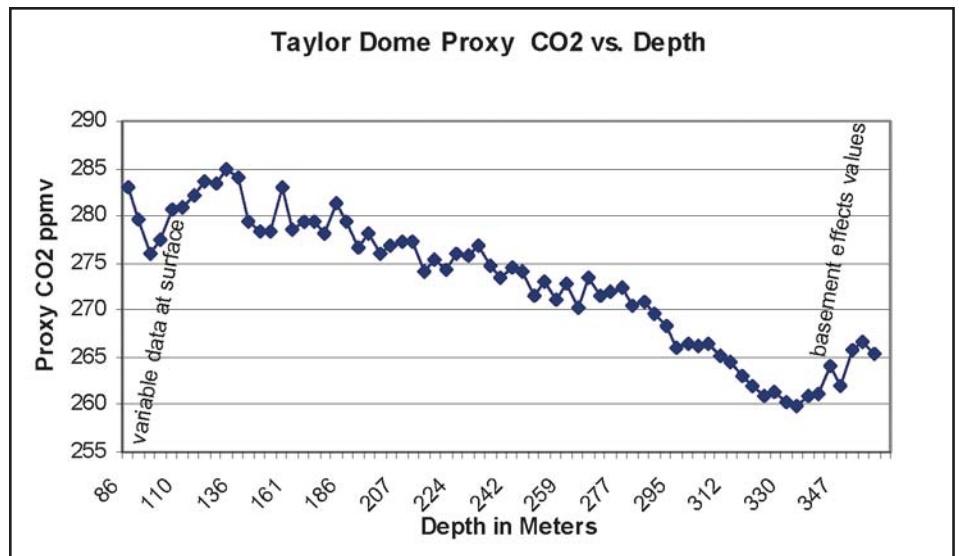


Figure 3.3. This is a plot of proxy CO<sub>2</sub> values versus depth from the Taylor Dome Ice Core. This data together with data from Siple Dome is used to establish a pre-industrial level for CO<sub>2</sub> of 280 ppmv in the IPCC 2007 report. This core covers an age range from the 17th Century into the Holocene, 8,992BP covering four well documented warm periods, and yet, shows no variability in concert with the climatic cycles. The most striking feature of the proxy CO<sub>2</sub> values is the progressive decrease with depth suggesting depletion by diffusion from decompression and mechanical fracturing of the core during drilling.

The depth corresponds to burial pressure in the ice where each 100 meters is equivalent to roughly one atmosphere of pressure. The burial depth at Taylor Dome

is some 350 meters so that the pressure at the base of the core is 3 bars, or about 50 psi. When the core is recovered, decompression and drilling stress causes



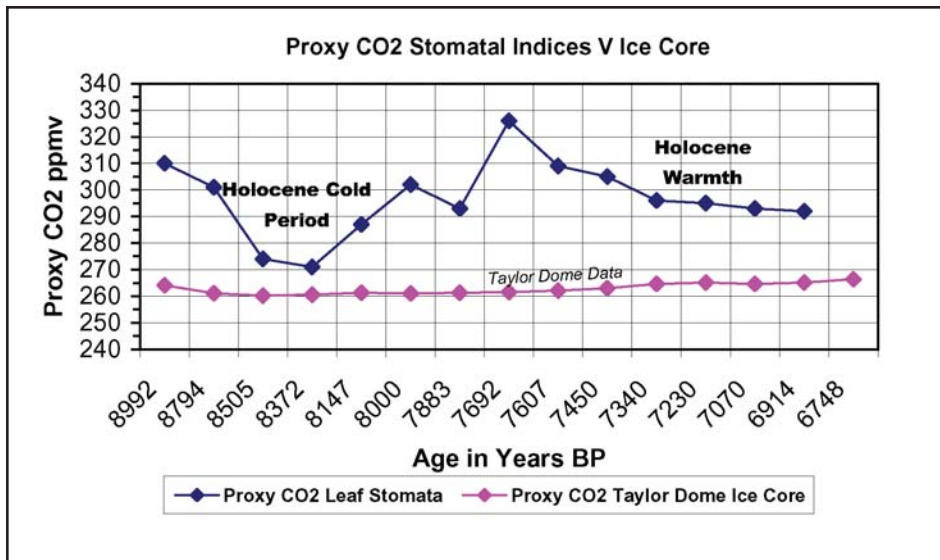


Figure 3.4. The number of stomatal pores in plant leaves respond to atmospheric CO<sub>2</sub>. The greater the CO<sub>2</sub>, the fewer pores develop. The upper curve then is a proxy CO<sub>2</sub> curve based on stomatal indices in Birch leaves after Wagner et al. 2002. Note the consistently higher proxy values based on stomatal indices and the clear response to the well known Holocene cooling event. In contrast, the ice core data is invariant with a steady decline in proxy values with depth and shows no response to the Holocene cold period. Data from noaa.gov/pub/paleo/ice\_core/antarctica/taylordome.

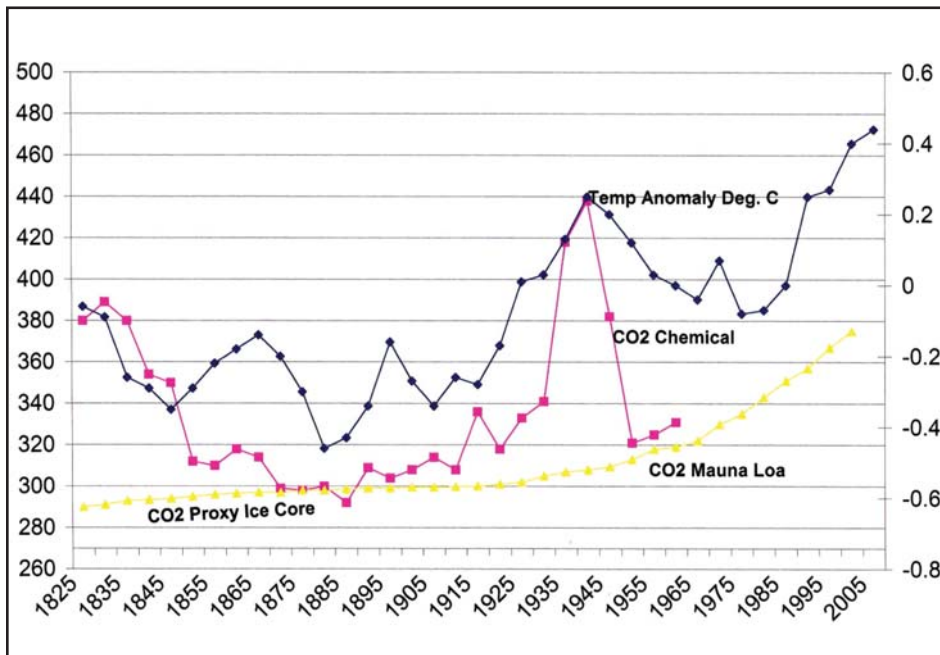


Figure 3.5. A comparison of Proxy CO<sub>2</sub> ice core data with CO<sub>2</sub> derived by analytical chemical methods from 1850-1958. The results are displayed against the average temperature in the northern hemisphere from GISS. The chemical analyses are displayed as five-year averages and show significant variation associated with cooling and warming of the climate, while the proxy ice core data is flat and invariant. The atmospheric CO<sub>2</sub> content after 1958 is from Mauna Loa observatory. Figure modified after Beck 2007.

a network of fine cracks which attract and absorb bipolar molecules such as CO<sub>2</sub> and H<sub>2</sub>O. The cracks become diffusion paths for trapped gases to leave the ice, or for some atmospheric gas to enter, thus causing a depletion of the original CO<sub>2</sub> content of the core. (Jaworowski, 2007; Hurd, 2006). There is also strong evidence

indicating that the CO<sub>2</sub> values in ice cores are depleted. Stomatal frequency analysis in fossil birch leaves (Wagner, 1998; Wagner et al., 2002) show a much greater variation in CO<sub>2</sub> values from 270 ppmv up to 323 ppmv (Figure 3.4, top curve). Furthermore, there is a significant response to the Holocene cooling event

from 8400-8100 BP. The atmospheric CO<sub>2</sub> content decreases concurrent with increased solubility in the cooling ocean. In comparison the ice cores at Taylor Dome demonstrate nearly flat values. (Figure 3.4, lower curve).

Further evidence of the variability of CO<sub>2</sub> values has been provided in a review by Beck (2007) of some 90,000 analytical measurements conducted before 1958 and dating back to the nineteenth century. The CO<sub>2</sub> show rather large variations, in contrast to the ice core data's flat and invariant CO<sub>2</sub> proxy data. Beck's summary of the analytical data documents a large increase in CO<sub>2</sub> values co-incident with the warming observed from 1920 to 1940 (Figure 3.5). In general, this data is rejected by IPCC but not on grounds of analytical accuracy, which is excellent, but because the values did not fit their preconceived concepts. Beck's review is thorough and comprehensive, and convincingly demonstrates significant variability in atmospheric CO<sub>2</sub> in contrast to ice core data.

Although a great deal has been made of the dangers of CO<sub>2</sub> emissions, much of it is nothing more than fear mongering. The truth is that CO<sub>2</sub> is highly beneficial to the planet. The measurements at the Mauna Loa recording station are demonstrating an increase in amplitude of the seasonal CO<sub>2</sub> cycle (high in winter, low in summer), which indicates that CO<sub>2</sub> fertilization is expanding the biosphere and, in fact, creating a negative feedback. Plants use CO<sub>2</sub> to produce the organic molecules which forms their tissues. Higher levels of CO<sub>2</sub> in the air allows plants to grow bigger, produce more branches and leaves, expand their root systems, and produce more flowers and fruit (Idso, 1989). There is an extensive amount of published data indicating the growth enhancement provided by a 300 ppmv increase in atmospheric CO<sub>2</sub>. (Poorter, 1993; Ceulmans and Mousseau, 1994; Wullschlegel et al., 1995 and 1997). Fertilization by CO<sub>2</sub> causes plants to produce fewer stomatal pores per unit area of leaf and the pores are narrower. This change reduces most plants' rate of water loss by transpiration allowing them to withstand drought conditions more effectively (Tuba et al., 1998; Idso and Quinn, 1983).

Similarly in the oceans, CO<sub>2</sub> fertilizes the organisms at the base of the food chain. The high solubility of CO<sub>2</sub> in cold water explains the rich organic life of the cold



Arctic and Antarctic waters. Alarms have been raised concerning acidification of ocean waters. However, much of this is unfounded as sea water is not inorganic brine but is dominated by organic life which interacts with the oceans chemistry. Surface waters in particular are teeming with microorganisms. Cyanobacteria at the base of the oceanic food chain photosynthesis CO<sub>2</sub> to provide sugars and give up oxygen. These very ancient organisms are believed to have provided the oxygen in the ancient atmosphere, which originally was dominated by nitrogen and carbon dioxide, which has had concentrations ranging up to 5,000 ppmv in the Palaeozoic. These values are up to 13 times higher than present day numbers. During the early part of the Palaeogene Period, from 65 to 34 million years ago, global climates were much warmer than today with very little ice at the poles, and CO<sub>2</sub> levels up to 5 times greater than today at 1,889 ppmv. (Pagani, 2005). The richness and diversity of life at this time does not indicate any injurious effects to the biosphere of significantly higher CO<sub>2</sub>.

Finally, the IPCC claim that the reported warming since 1979 is very likely caused by the human emission of greenhouse gases (mainly CO<sub>2</sub>) can not be supported because it places an undue reliance on proxy CO<sub>2</sub> values from ice cores. The ice core data, because of the low and invariant values would indicate a prolonged cold period. This is not supported by well documented cycles of warming and cooling since the Holocene. Therefore, one has to conclude that the ice core data is wrong or CO<sub>2</sub> has no obvious connection with climate change. The only coincidental correlation of CO<sub>2</sub> with warming climate has occurred in the decades from the 1980s to 1990s. This correlation no longer appears relevant since there has been no warming since 1998 and the climate has cooled significantly since 2007. The failure to demonstrate a link between CO<sub>2</sub> and climate change indicates that the policies being called for to fight climate change can not be justified and are unnecessary. To follow this path will result in an enormous misuse of capital that diverts from developing more effective and efficient methods of energy use. The public debate over climate change has strayed far from objective science and has been extremely distorted by the errors and exaggerations in the reports of the IPCC. It is a profound embarrassment to science that hype and spin have replaced reason in such an important issue.

## REFERENCES

Beck, E. G. 2007. 180 years of CO<sub>2</sub> gas analysis by chemical methods. *Energy and Environment*, v. 18, no. 2, p. 258-282.

Ceulmans, R. and Mousseau, M. 1994. Effects of elevated CO<sub>2</sub> on woody plants. *New Phytologist* v. 127, p. 425-446.

Friedli, H. et al. 1986. Ice core record of the 13C/12C ratio of atmospheric CO<sub>2</sub> in the past two centuries. *Nature*, v. 324, p. 237-238.

Gerlich, G. and Tschuschner, R. D. 2007. Falsification of the atmospheric CO<sub>2</sub> greenhouse effects within the frame of physics. *arXiv:0707.1161v1[Physics.a0-ph]* 8 July 2007.

Hurd, B. 2006. Analyses of CO<sub>2</sub> and other atmospheric gases. *AIG News*, no. 86, p. 10-11.

Idso, S. B. and Quinn, J. A. 1983. Vegetational redistribution in Arizona and New Mexico in response to doubling of the atmospheric CO<sub>2</sub> concentration. *Laboratory of Climatology, Arizona State University, Tempe, Arizona. Climatological Publications Scientific Paper no. 17.*

Indermuhle et al. 1999. Holocene carbon cycle dynamics based on CO<sub>2</sub> trapped in ice at Taylor Dome, Antarctica. *Nature*, v. 398, p. 121-126.

Intergovernmental Panel on Climatic Change. 1990. *Climate Change – The IPCC Scientific Assessment*. Cambridge University Press, Cambridge.

Intergovernmental Panel on Climatic Change. 2001. *Climate change 2001: The scientific basis*. Cambridge University Press, Cambridge.

Intergovernmental Panel on Climatic Change. 2007. *Climate change: The physical science basis. IPCC Summary for Policymakers. Fourth Assessment Report*. Geneva, Switzerland.

Jaworowski, Z. 1994. Ancient atmosphere - validity of ice core records. *Environmental Science and Pollution Research* v. 1, pt. 3, p. 161-171.

Jaworowski, Z. 2007. *The greatest scientific scandal of our time*. *EIR, Science*. March 16.

Lamb, H. H. 1965. *The Early Medieval Warm Epoch and its sequel*. *Palaeogeography, Palaeoclimatology, Palaeoecology*. v. 1, p. 13-37.

Neftel, A. et al. 1985. Evidence from polar ice

cores for the increase in atmospheric CO<sub>2</sub> in the past two centuries. *Nature*, v. 315, p. 45-47.

Pagani, M. 2005. *Deep sea algae connect ancient climate, carbon dioxide and vegetation*. Yale University, June 27 2005.

Poorter, H. 1993. Interspecific variation in the growth response of plants to an elevated ambient CO<sub>2</sub> concentration. *Vegetation 104/105*: p. 77-97.

Schack, A. 1929. *Industrial Heat Transfer*. (in German) *Stahleisen m.b.H., Dusseldorf, First Published 1929, 8th Edition 1983*.

Schack, A. 1972. The influence of the carbon dioxide content of the air on the climate of the world. (in German) *Physikalische Blatter* v. 28, p. 26-28.

Schimmel, D. S. 1995. *Global Change Biology*. v. 1, p. 77-91.

Spencer, R. 2008. *Climate confusion: How global warming hysteria leads to bad science, pandering politicians, and misguided policies that hurt the poor*. *Encounter Books, New York*.

Spencer, R. W., Braswell, W. D., Christy, J. R., and Hnilo, J. 2007. Cloud and radiation budget changes associated with tropical intraseasonal oscillations. *Geophysical Research Letters*, v.34 L15707, doi: 10.1029/2007 GL 029628.

Svensmark, H., and Friis-Christensen, E. 1997. Variation of cosmic ray flux and global cloud coverage – A missing link in solar climate relationship. *Journal of Atmospheric and Solar-Terrestrial Physics*, v. 59, no. 11, p. 1225-1232.

Tuba et al. 1998. Carbon gains by desiccation tolerant plants at elevated CO<sub>2</sub>. *Functional Ecology*. v. 12, p. 39-44.

Wagner, F. et al. 1999. Century-scale shifts in Early Holocene atmospheric CO<sub>2</sub> concentrations. *Science*, v. 284, p. 1971-1973.

Wagner, T., Aaby, B., and Visscher, H. 2002. Rapid atmospheric CO<sub>2</sub> changes associated with the 8200-years-BP cooling event. *Proceedings of the National Academy of Sciences*, v. 99, no. 19, p. 12011-12014.

Wullschleger, et al. 1997. Forest trees and their response to atmospheric CO<sub>2</sub> enrichment: A compilation of results. In: *Advances in Carbon Dioxide Effects Research*. L.H. Allen et al (eds.). *American Society of Agronomy, Madison, WI*. p. 79-100.

Wullschleger et al. 1995. *On the potential for*



a CO<sub>2</sub> fertilization effect in forests: Estimates of biotic growth factor based on 58 controlled exposure Studies. In: *Biotic Feedbacks in the Global Climatic System*. G.M. Woodwell and F.T. MacKenzie (eds.). Oxford University Press, New York. p. 85-107.

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# CLIMATE CHANGE IV:

## *The Greenhouse Effect*

by Dr. A. Neil Hutton

Let us discuss the 'greenhouse effect', which must be the most misused term ever in scientific literature. Planetary atmospheres do not remotely resemble the warming air inside a greenhouse. The warming effect in a greenhouse results from the fact that there is no source of cooler air to circulate by convection. This, of course, can be remedied by opening doors or vents in the roof.

There is a historic misconception that the glass of a greenhouse traps infrared radiation. In 1909, R. W. Wood showed that the greenhouse effect did not result from trapped radiation. He created an enclosure with a window of rock salt (NaCl), which is transparent to visible light as well as infrared, and compared it with a second enclosure using glass as a window. The enclosure with the rock-salt window became warmer than did the enclosure with glass because it was transparent to almost the entire spectrum while the glass was not. If glass was placed in front of the salt-faced enclosure, the temperatures equalized. Wood concluded that trapping of infrared radiation within a glass enclosure is of minimal importance in comparison to the lack of convective circulation.

The atmosphere is a veritable "mixmaster" in terms of circulation as warm tropical air is driven to the poles and, under the influence of the Coriolis force, causes the trade winds and westerlies of the northern and southern hemispheres. In addition, locally and regionally, convection drives the weather systems to draw up water vapor generated by evaporation into the atmosphere, which is then returned as precipitation. These systems act to redistribute heat in the atmosphere and maintain a degree of climatic equilibrium. Thus, it is clear that the Earth's atmosphere is not remotely like the air in a greenhouse.

A fundamental hypothesis of the so-called "greenhouse effect" is that if there were no atmosphere the average temperature of the Earth would be  $-18^{\circ}\text{C}$  ( $255^{\circ}\text{K}$ ). This is a totally theoretical construct, or thought experiment, since it is probable that never in Earth's history has this condition occurred. Moreover, the Earth has a radioactive core which continuously generates heat, currently at a rate of 87 milliwatts per square meter, which is neither seasonal nor diurnal. The generation of heat along ocean-spreading

centres is believed to average up to 120 milliwatts per square meter. The failure to realize this resulted in Kelvin's erroneous estimate of the age of the Earth as 100 million years. Therefore, the relevance of the theoretical temperature of the atmosphereless Earth to the greenhouse effect is questionable.

Furthermore, the Earth is 70% ocean. Is it possible to have an atmosphere-less Earth with oceans (see Gerlich and Tschuschner, 2007)? The oceans have a fundamental influence on climate and the atmosphere. The globally averaged near-surface temperature amounts to  $15^{\circ}\text{C}$  ( $288^{\circ}\text{K}$ ). The difference in these values,  $288^{\circ}\text{K} - 255^{\circ}\text{K}$  is  $33^{\circ}\text{K}$ , which is attributed to the effect of the atmosphere ("greenhouse effect"). In a recent paper, Essex et al., (2006) have questioned the entire concept of an average global temperature. They argue, "while the statistic is nothing more than an average over temperatures, it is regarded as "the temperature," as if an average over temperatures is actually a temperature in itself, and as if the out-of-equilibrium climate system has only one temperature. But an average of temperature data sampled from a non-equilibrium field is not a temperature. Moreover, it hardly needs stating that the Earth does not have just one temperature. It is not in global thermodynamic equilibrium – neither with itself nor with its surroundings." And finally, "The temperature field of the Earth as a whole is not thermodynamically representable by a single temperature."

Unfortunately the terms 'greenhouse effect' and 'greenhouse gases' have stuck in the climatological literature and in the popular press. Because infrared radiation is not trapped in a greenhouse and convection is not constrained in the atmosphere, the term is an oxymoron. It is misleading since it implies some sort of boundary layer in the atmosphere and is far from descriptive of the dynamic role of the gases in the atmosphere. It has become established as climatological jargon but tends to confuse even those who should know better. Of more than 20 descriptions of the greenhouse effect that I have reviewed, many of them are simply wrong or misleading. Although it is now acknowledged that the greenhouse analogy is incorrect, nevertheless, even supposedly authoritative works, such as the

Encyclopedia of Astronomy and Astrophysics (2001) has the following definition (my emphasis below):

"The greenhouse effect is the radiative influence exerted by the atmosphere of a planet which causes the temperature at the surface to rise above the value it would normally reach if it were in direct equilibrium with sunlight (taking into account the planetary albedo). This stems from the fact that certain gases have the ability to transmit most of the solar radiation and to absorb the infrared emission from the surface. The thermal (i.e., infrared) radiation intercepted by the atmosphere is then **partially reemitted towards the surface**, (in some texts this is referred to as back radiation) thus contributing additional heating to the surface. Although the analogy is not entirely satisfactory in terms of physical processes involved, it is easy to see the parallels between the greenhouse effect in the atmosphere-surface system of a planet and a horticultural greenhouse: **the planetary atmosphere plays the role of the glass cover that lets sunshine through to heat the soil while partly retaining the heat that escapes from the ground.**"

Even in the IPCC, 2007. Historical Overview of Climate Change (p. 115), "Much of this thermal radiation emitted by land and ocean is absorbed by the atmosphere including clouds, and re-radiated back to Earth. This is called the 'the greenhouse effect.' The glass walls in a greenhouse reduce airflow and increase the temperature of the air inside. **Analogously, but through a different physical process the Earth's greenhouse effect warms the surface of the planet.**" This is not an analogue since the physical processes present a complete contrast in function.

There is obviously a serious reluctance to give up the greenhouse analogy although it is well recognized that it is incorrect. Both descriptions above introduce the concept of back radiation, suggesting that somehow long-wave infrared radiation is intercepted and radiated back to warm the Earth's surface. This concept held by climatologists has been challenged by theoretical physicists and others (Thieme, 2003; Gerlich and Tschuschner, 2007; Kramm, 2008). If the



outgoing thermal radiation from the Earth's surface is absorbed then the warmed air will expand and rise convectively so that the absorbed warmth is taken away by air mass exchange as well as cooling from the adiabatic pressure drop. Most people will be familiar with the heat of gas compression when inflating a tire or the cooling effect of decompression in snow-making equipment.

As pressure drops with elevation, so does temperature – reaching  $-65^{\circ}\text{C}$  at the top of the troposphere at about 10,000 meters. The Second Law of Thermodynamics states that warmth can never spontaneously pass from a body of low temperature to a body of high temperature without the application of work. Thus according to our understanding of the ideal gas laws and thermodynamic laws, back radiation is not possible. The concept implies reflection but there is no such boundary layer. The cooler atmosphere can not warm the surface. Nevertheless, this is a basic tenet of global warming theory.

A cornerstone of the IPCC discussion of the "Greenhouse Effect" (Figure 4.1) is the KT97 model of the Earth's Global Mean Energy

Budget (Kiehl and Trenberth, 1997 Figure 7, p. 206). Although this study purports to have constrained measurements of the energy flux by satellite observations, in fact the instrument error range is much greater than any detectable variation at the top of the atmosphere (Spencer, 2007). With respect to measurements of surface fluxes of long-wave radiation the study relies on model calculations based exclusively on radiative heat transfer and the spectral characteristics of the various gases.

The model study is conducted on standardized atmosphere profiles. These standard profiles are static and essentially two-dimensional. As the KT97 model indicates, the treatment of cloud is accomplished as three simple static layers of low, intermediate, and high cloud randomly overlapped to provide on average 62% cover (a simplistic and unrealistic static model). Although Kiehl and Trenberth themselves highlight a series of difficulties in developing a global energy budget, nonetheless it has become the showpiece of the IPCC assessments (Historical Overview of Climate Change Science, Figure 1, p. 96)

$\text{CO}_2$  represents only 0.0375% by volume of the atmosphere and it demonstrates infrared absorption in three slender bands involving less than 8% of the infrared spectrum; however, the KT97 Study attributes 26% of the radiative forcing to  $\text{CO}_2$ . If such an extreme effect existed, concentrated  $\text{CO}_2$  in the laboratory should demonstrate a heat conductivity anomaly, which is not the case. Furthermore, nowhere in climatological literature have we seen any discussion of the quantum energy states of  $\text{CO}_2$  molecules in the range from  $-10$  to  $-65^{\circ}\text{C}$ , the dominant temperature of the troposphere. The emissivity of a substance is a function of temperature.

One of the problematic issues with this model is that the energy reaching the top of the Earth's atmosphere during daytime is about 1,370 watts per square meter ( $\text{w}/\text{m}^2$ ). However, because the planet is spherical, the energy averaged over the whole planet is approximately one quarter of this value, or  $342 \text{ w}/\text{m}^2$ . Of this quarter of the sun's energy, approximately  $107 \text{ w}/\text{m}^2$  is reflected, while an additional  $67 \text{ w}/\text{m}^2$  is absorbed in the atmosphere as shown in Figure 4.1.

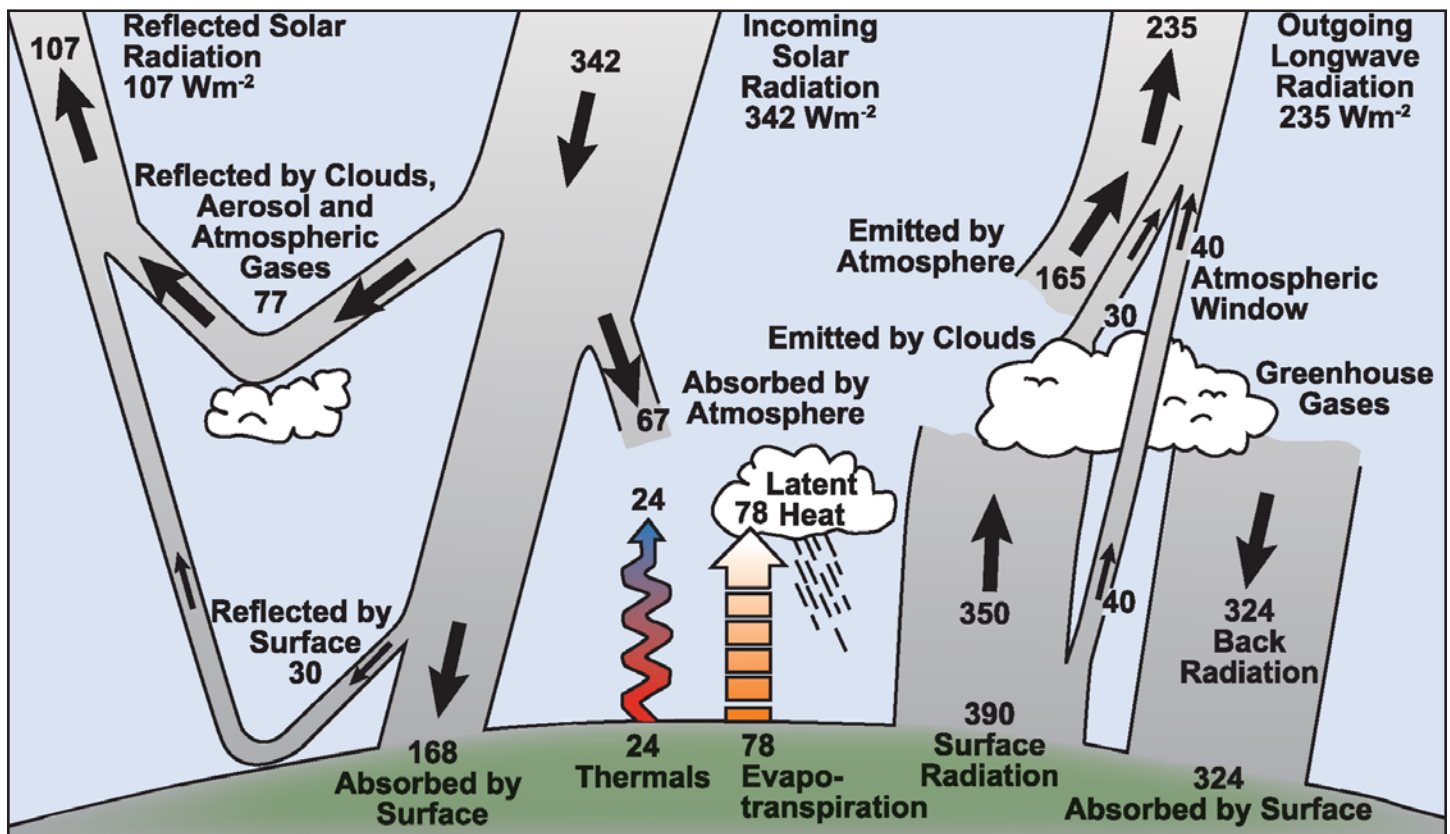


Figure 4.1. Estimate of the Earth's annual and global mean energy balance. According to this model, the amount of incoming solar radiation absorbed by the Earth and atmosphere is balanced by the Earth and atmosphere releasing the same amount of outgoing long-wave radiation (new research regarding the warming of the stratosphere by cosmic rays tends to invalidate this basic concept. Osprey et al. (2009), Geophysical Research Letters). About half of the incoming solar radiation is absorbed by the Earth's surface. This energy is transferred to the atmosphere by warming the air in contact with the surface (thermals), by evapotranspiration, and by long-wave radiation that is absorbed by clouds and greenhouse gases. It is further claimed that the atmosphere in turn radiates long-wave energy back to Earth as well as out to space. The latter concept is challenged by many scientists as discussed in the text (IPCC, Historical Overview of Climate Science, I, p. 96, FAQ 1.1, Figure 1, after Kiehl and Trenberth, 1997).



Consequently,  $168 \text{ w/m}^2$  reaches and is absorbed by the surface; however, this radiated energy is not sufficient to heat the surface to  $+15^\circ\text{C}$ . In the KT97 model, the problem is solved by the atmosphere – by some unknown means – producing  $324 \text{ w/m}^2$  that are “back radiated” down to the Earth’s surface. That this violates the first and second laws of thermodynamics appears to be of no consequence to climatologists. It is clear that attempting to explain the Earth’s energy solely from radiative heat transfer presents significant problems and that the radiative-heat-transfer greenhouse theory is seriously flawed.

On the right side of Figure 4.1 are two fluxes – one from the surface producing  $350 \text{ w/m}^2$  and the other ‘back radiation’ yielding  $324 \text{ w/m}^2$  to the surface. This appears to be a completely circular energy flow with no actual source. In order to back radiate this energy flux, the atmosphere would be required to have a temperature higher than the surface. The adiabatic nature of the atmosphere dictates a decrease of temperature with elevation. The drop in temperature is typically about  $6.5^\circ\text{C}$  per kilometer, so that at a height of five kilometers (mid-troposphere) the temperature is  $-32.5^\circ\text{C}$ , which can not possibly initiate a down-going energy flux of this magnitude. Furthermore, as Thieme (2007) argues, radiant fluxes are definable as to magnitude and direction as vectors. The sum of vectors will produce a new vector modified in magnitude and direction, but with the proviso that two exactly equal vectors of opposite direction will sum to zero. The reality (Figure 4.1) is that, in fact, only  $40 \text{ w/m}^2$  are radiated from the surface. The outgoing  $350 \text{ w/m}^2$  and back radiation of  $324 \text{ w/m}^2$  are imaginary, again contradicting physical laws since this is in reality a perpetual motion machine of the second kind (Kramm, 2007; Gerlich and Tschuschner, 2007; and Thieme, 2003).

Much is made of the impact of trace gases in the atmosphere, but what of the effect of the other 99% which can neither absorb nor emit infrared. Nitrogen and oxygen, the principal components of air, are heated during the day by conduction as ground temperature exceeds that of the air. The air warmed by conduction and convection can not efficiently transmit this energy because the nitrogen and oxygen of the air can neither absorb nor emit infrared radiation. The energy absorbed by the air can not be transmitted to space but will be retained to warm the ground as the temperature of the surface falls below that of the air. The thermal conductivity of oxygen and nitrogen is very low so that in the absence of convection, air is an excellent insulator. Is it possible,

although never discussed in the literature, that the atmosphere in itself is actually an efficient insulator?

Gerlich and Tschuschner (2007), two theoretical physicists, published on the internet an extensive article challenging greenhouse theory and reviewing all of the mathematical and thermodynamic principles involved. They challenged the notion of an Earth with no atmosphere, as well as the concept of global average temperature as an indication of global emissivity, because in reality each square meter of the Earth’s surface has a unique characteristic depending on its composition – forest, meadow, asphalt, water, snow, desert, tundra, and so on. So that as Essex et al. (2006) argue, there is no global average temperature and it has no validity within the energy balance concept, and they question the ability of the troposphere at  $-65^\circ\text{C}$  to warm the surface at  $+15^\circ\text{C}$ .

The greenhouse theorists, argue that every substance radiates if it is above absolute zero. But does this apply to gases? The fundamental argument is that oxygen and nitrogen are transparent to long-wave radiation. Gerlich and Tschuschner argue that the Planck and Stefan-Boltzman equations used in calculations of radiative heat transfer can not be applied to gases in the atmosphere because of the highly complex multi-body

nature of the problem.

The orthodoxy on the other hand argues that photons are emitted in all directions at all times within the quantum realm. Two bodies at different temperatures will continue to radiate since the colder body does not recognize the adjacent warmer body. However, in the observable realm the net transfer of energy is still from the warm object to the colder object until equilibrium is achieved, which is never in the out-of-equilibrium climate system. The argument may be valid in terms of solid objects but presents enormous difficulty in a gaseous atmosphere where molecular diffusion is intense and the atmosphere is in constant non-equilibrium motion. Therefore, although photons may be emitted towards the surface, the net energy flow will always be from the warm surface to the atmosphere. So that, unless climatology has developed some new thermodynamic principle, back radiation is denied by fundamental thermodynamic laws.

The development of greenhouse theory is exclusively developed around radiative heat transfer because the imperative of its authors was to establish  $\text{CO}_2$  as the causative mechanism in climate change to the exclusion of anything else. This perspective ignores the fact that climate is subject to other drivers, and while it continuously moves toward equilibrium it never achieves this state.

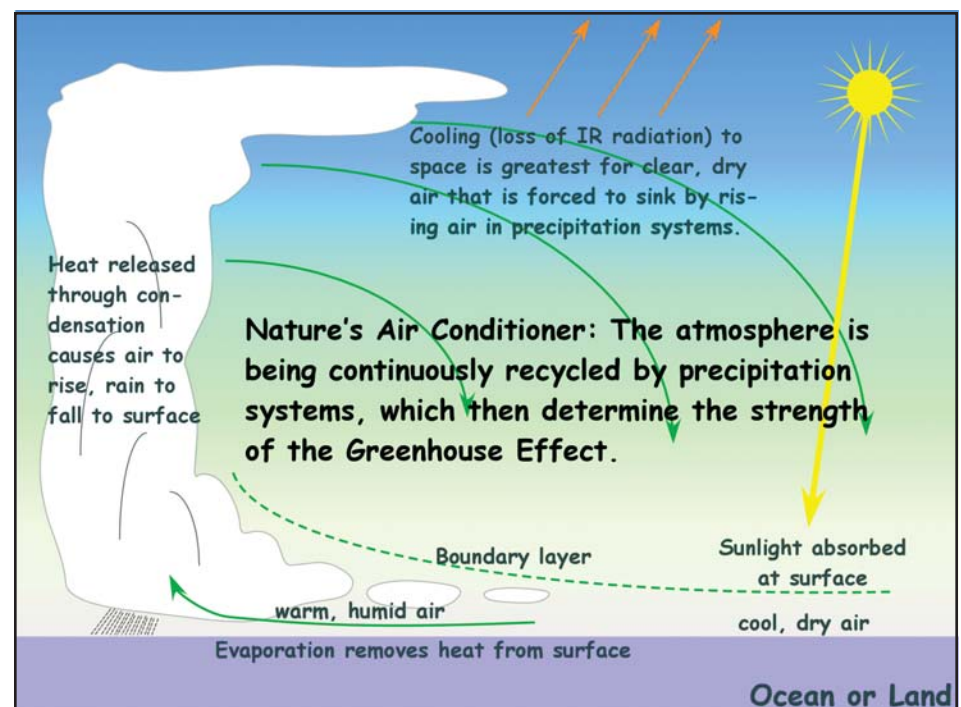


Figure 4.2. The concept developed by Spencer of the effects of thermal redistribution in the atmosphere. Atmospheric air gets continuously recycled through precipitation systems, which then directly or indirectly control water vapour and cloud properties, and thus the Earth’s greenhouse effect. Spencer and his colleagues have now shown that the handling of clouds in atmospheric circulation models is incorrect (Spencer, R.W., 2008).



Spencer (2007) argues that precipitation systems act as the Earth's thermostat (Figure 4.2) and states: "I believe it can be demonstrated that precipitation systems ultimately control most of the Earth's natural greenhouse effect. The air in our atmosphere is continuously recycled through precipitation systems (see Figure 4.2), on a timescale of days to weeks. Wind picks up water vapour that has been evaporated from the surface, and then transports this vapour to precipitation systems. Those systems then remove some of that vapour in the form of rain or snow."

This view is generally understood by climatologists, but what are not understood are the myriad microphysical processes within clouds. The orthodox view incorporated into all General Circulation Models is that the very small effect of CO<sub>2</sub> will be amplified by an increase in cloud thereby increasing the warming – a positive feedback. Spencer (2009) and his colleagues (Spencer and Braswell, 2008; Spencer et al., 2007), have been able to document from detailed analysis of satellite data that the climate system is much less sensitive to greenhouse gas emissions than has been claimed by the IPCC. This body of research has profound implications for the theoretical basis of Anthropogenic Global Warming since instead of relying on theoretical assumptions unconstrained by measurement and observation, Spencer and his colleagues have done exactly the opposite by examining satellite data in great detail and then determining which aspects of the climate system best explain the observations. The results are salutary; the detailed observations indicate that net feedbacks in the real climate system on both short- and long-term time frames are negative. Misinterpretation of cloud behaviour has led modelers to build models in which cloud

feedbacks are positive. The models, therefore, predict too much warming in response to anthropogenic greenhouse gas emissions. That this is correct is well demonstrated by the last 10 years where the IPCC projections for the thermal response of the atmosphere consistently overstate the case.

In conclusion, the greenhouse theory of anthropogenic global warming is seriously flawed and certainly provides no scientific basis to introduce policy measures. This will cause a serious misapplication of scarce capital to projects that will have no influence on climate. The amount of capital already squandered to this date on this fruitless endeavour will, without doubt, emerge as one of the greatest scientific scandals of the 20th and 21st Centuries. The almost evangelical need to save the planet has overridden any scientific objectivity.

#### REFERENCES

Essex, C., McKittrick, R., and Andresen, B. 2007. Does a global temperature exist? *Journal Non-Equilibrium Thermodynamics*, v. 32, no. 1, p. 1-27.

Gerlich, G. and Tschuschner, R. D. 2007. Falsification of the CO<sub>2</sub> greenhouse effects within the frame of physics. *arXiv: 0707.1161 v.1 [Physics.ao-ph]* 8 July 2007.

Intergovernmental Panel on Climate Change. 2007. *Climate change: the physical science basis, Summary for Policymakers. Fourth Assessment Report*, Geneva, Switzerland.

Intergovernmental Panel on Climate Change. 2007. *Climate change: historical overview of climate change science. Fourth Assessment Report*, Geneva, Switzerland.

Kiehl, J.T. and Trenberth, K. 1997. Earth's annual mean global energy budget. *Bulletin of the*

*Meteorological Society*, v.78, no. 2, p.197- 208.

Kramm, G. 2008. Contribution to discussion of Gerlich and Tschuschner paper. Falsification of the CO<sub>2</sub> greenhouse effects within the frame of physics. *Rabett.blogspot.com/2008/02/all-you-never-wanted-to-know.html*. Items 180, 457, 735, 770, and 844.

Murdin, P. (Ed.). 2001. *Encyclopedia of astronomy and astrophysics*. Nature Publishing Group, New York. <http://ea.crcpress.com>.

Spencer, R.W. 2008. *Climate Confusion: How global warming hysteria leads to bad science, pandering politicians and misguided policies that hurt the poor*. Encounter Books.

Spencer, R.W. In press. Satellite and climate model evidence against substantial man-made climate change. *Journal Climate*.

Spencer, R. W., Braswell, W. D., Christy, J. R., and Hnilo, J. 2007. Cloud and radiation budget changes associated with tropical intra-seasonal oscillations. *Geophysical Research Letters*, 34, L15707, doi: 10.29/2007GL029698.

Spencer, R.W. and Braswell, W.D. 2008. Potential biases in cloud feedback diagnosis: A simple model demonstration. *Journal Climate*, Nov 1.

Thieme, H. 2003. On the phenomenon of atmospheric backradiation. <http://www.geocities.com/atmosco2/backrad.htm>.

Wood, R. W. 1909. Note on the theory of the greenhouse. *Philosophical Magazine* v. 17, p. 319-320. [www.mconolley.org.uk/sci/wood\\_rw.1909.html](http://www.mconolley.org.uk/sci/wood_rw.1909.html).

# CLIMATE CHANGE V:

## Here Comes the Sun

by Dr. A. Neil Hutton

The sun has provided the energy for almost everything on earth since life began, including its climate. Although not obvious in our daily lives on Earth, the sun's energy fluctuates in cycles with about an eleven-year periodicity. The evidence of solar activity is provided by sunspots which appear as dark blemishes on the sun's surface. They are caused by concentrated magnetic fields and massive flares of plasma. Sometimes individual spots can be several times the diameter of the earth. They are huge (Figure 5.1). The sun's activity has been gauged by counting the number of sunspots on a daily basis – the greater the number of spots, the greater the activity. The calculation of the sunspot number is complex, but now has a standardized approach, although there are two different systems currently being used. What is particularly useful about the sunspot numbers is that they have been observed for about 400 years and there is an excellent record of the cycles. On the other hand, the measure of the sun's energy, the Total Solar Irradiance (TSI) has only been recorded for the last 30 years. A record of the solar cycles for the last 400 years is shown in Figure 5.2. The most striking feature is almost total lack of activity in the sun for seven decades during the Maunder Minimum coincident with the depths of the Little Ice Age from 1645-1715. A second minimum (the Dalton Minimum) occurred from 1800-1830, and was also associated with a period of very cold climate.

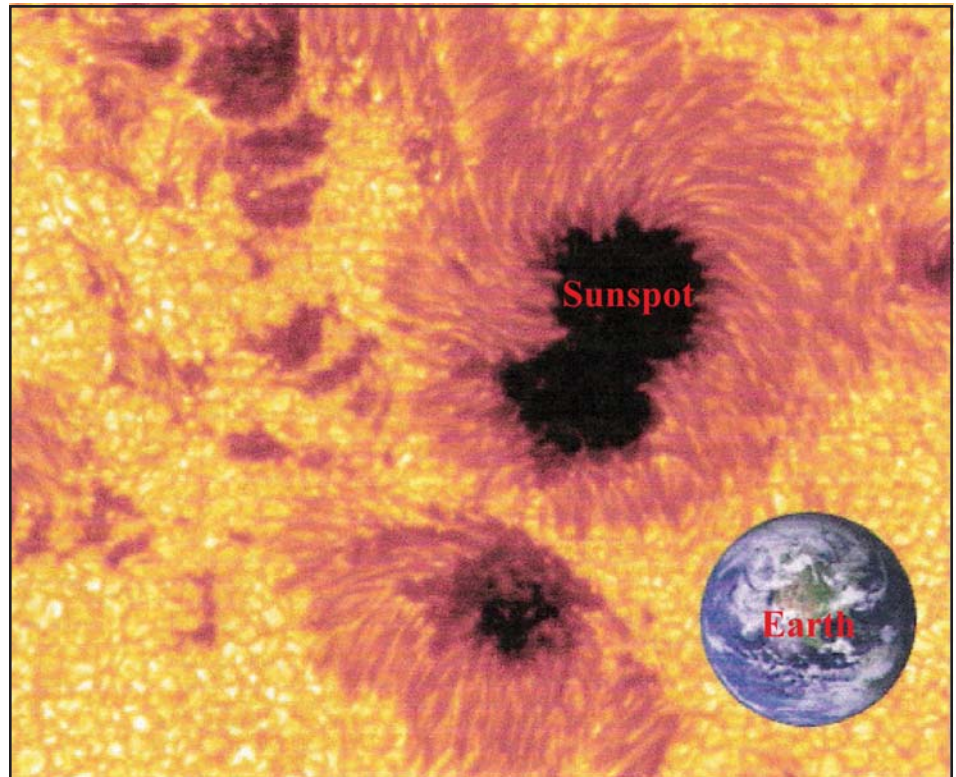


Figure 5.1. The Earth in scale relative to a typical large sunspot. Sunspots are believed to result from the fact that the sun is a viscous material in which the poles rotate at a different rate than the equator. This causes disruptions of the magnetic field, which erupt at the surface as sunspots. The intense magnetic activity inhibits normal convection, thus the dark spots are up to 1000 degrees C cooler than the background. (Source: [www.norcalblogs.com/watts/climate\\_change](http://www.norcalblogs.com/watts/climate_change)).

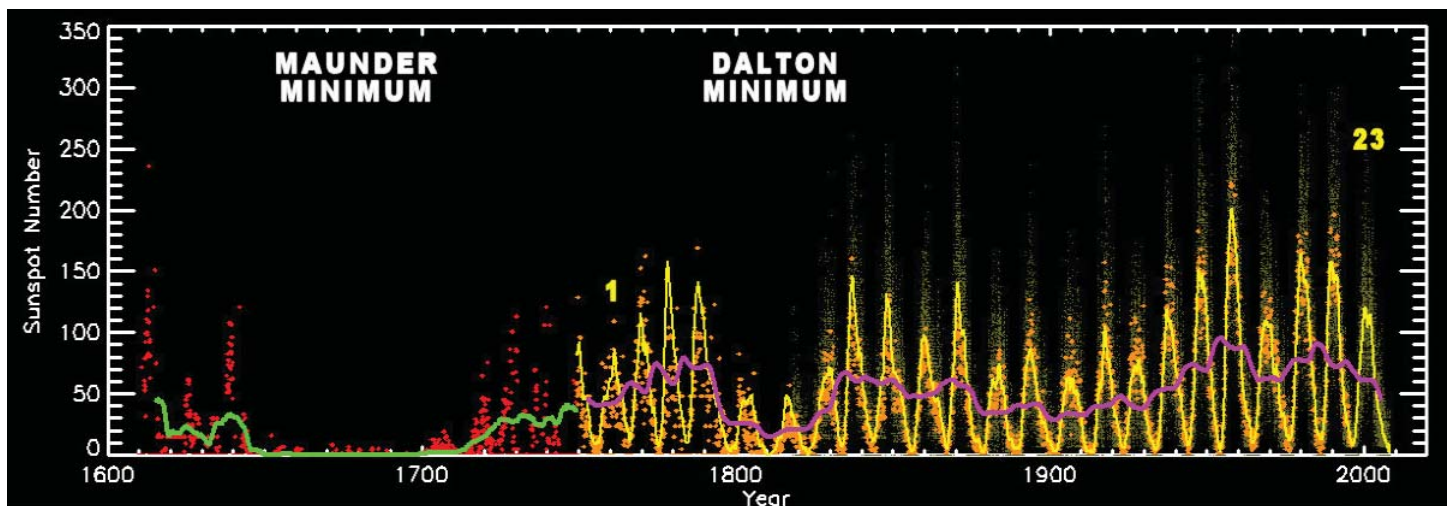


Figure 5.2. The record of sunspot numbers from 1610 to 2008. The yellow line is the averaged Wolf number in use after 1749. The red diamonds represent group numbers in use before 1749. The heavy green and magenta lines are the eleven-year mean of the monthly average of the group (pre-1749) and Wolf numbers (post-1749). Solar cycles 1 and 23 are shown in bright yellow. The magenta eleven-year mean shows very clearly that the warmth of the last part of the 20th Century is marked by significantly greater activity than at any time in the previous 400 years (Source: graphic from Stellar Spectrograph at Lowell Observatory data NASA and Royal observatory of Belgium).



# 400 Years of Sunspot Observations

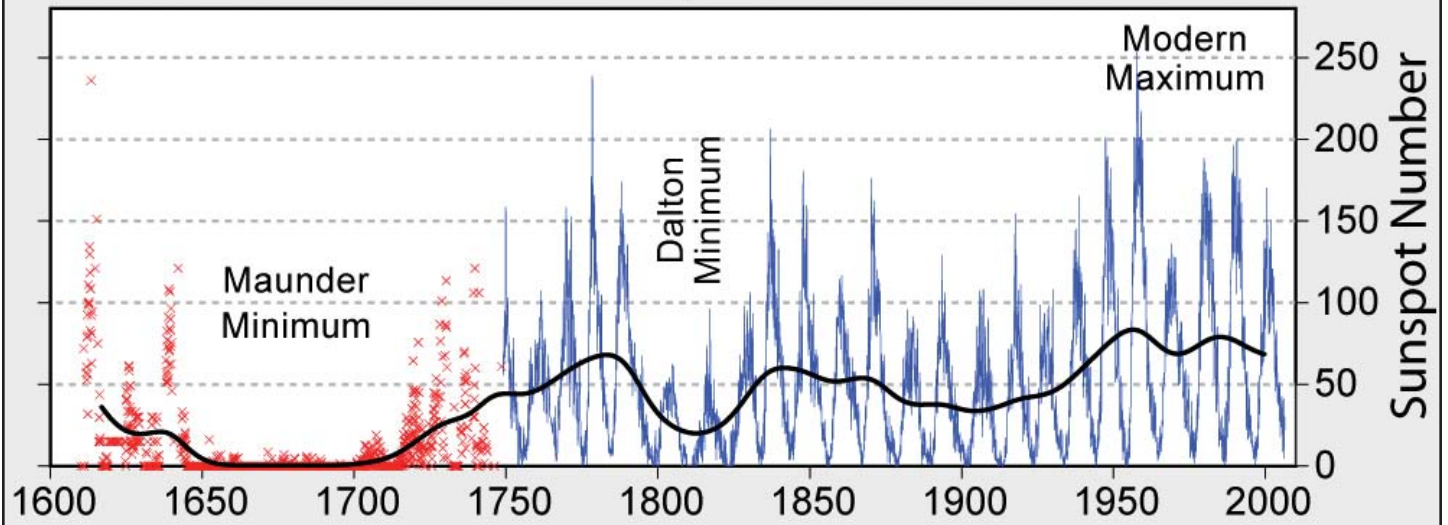


Figure 5.3. 400 Years of Sunspot Numbers with the eleven-year mean of the monthly averages (heavy black line) that shows the Modern Maximum Activity is higher than at any time in the past 400 years shown on the chart (Source, NOAA and Royal Observatory of Belgium, compiled by Hoyt and Schatten, 1998a, 1998b).

The warming of the last half of the 20th Century is marked by much higher sunspot activity than has been observed in the previous 200 years.

The Total Solar Irradiance will increase during the solar maxima (when the sun displays the maximum number of sunspots) and decrease during the solar minima (when the sun has fewest sunspots). Currently, it is

argued that these changes are so small that they can not significantly affect the climate. Measurements over the last 30 years suggest that during the minima, the sun produces 1,361 watts per square metre at the top of the atmosphere and this increases by only 1.3 watts per square metre (0.1%) during periods of maximum activity, apparently too small to cause significant warming. The IPCC (Historical Overview of Climate Change

Science, p. 108, 2007) categorically state that, "... changes in solar irradiance are not the major cause of the temperature changes in the second half of the 20th century, unless those changes can induce large feedbacks in the climate system." This totally begs the question of why climate was significantly colder during the Maunder and Dalton Minima, and fails to acknowledge that the sun, during the last four hundred years, had

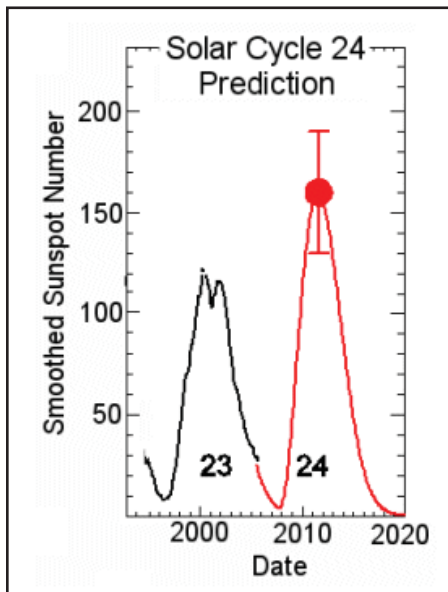


Figure 5.4a. The projection for Solar Cycle 24, as of December 2006, forecast that the cycle would peak about 2010 with a sunspot number of 160, plus or minus 25, making it the strongest solar cycle on record. In fact as of January 2009, the cycle had still not commenced after a cumulative total of 535 spotless days. (compare to Figure 5.4b for the current forecast; Source: NASA Science Headlines 21 December 2006).

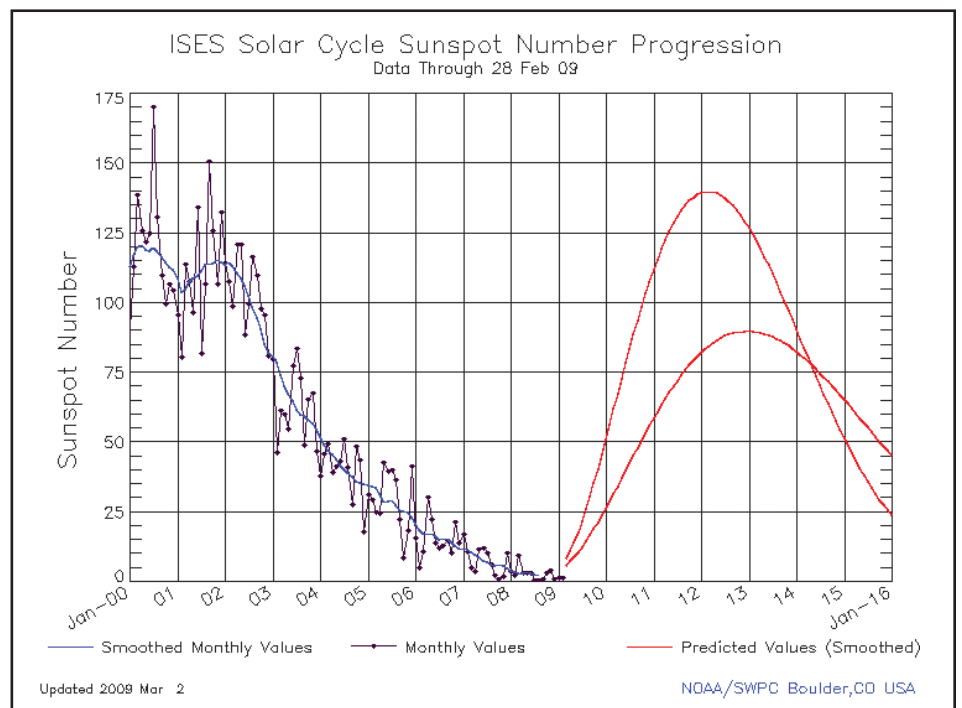


Figure 5.4b. The revised forecast for Solar Cycle 24 as of January 2009. The predicted high values are peaking in 2011, with a sunspot number of 140. The predicted low peaks in 2012 with a sunspot number of 90. Given the continued quiescence of the sun both predictions seem optimistic. The continuing drop of the AP Index (Figure 5.10) suggests that the sunspot number could very well be less than 50 (Source: NOAA/SWPC, Boulder, Colorado).



its most active period in the last half of the 20th Century (Figure 5.3).

Moreover, in order to justify the warming effect of traces of CO<sub>2</sub> in the atmosphere IPCC (ibid.) have appealed to the unproven assumption of positive cloud feedback to cause warming. Otherwise the traces of atmospheric CO<sub>2</sub> are incapable of having a significant effect. The cloud feedback assumptions have recently been shown to be incorrect, essentially invalidating all previous results from computer-generated climate models, all of which assume positive feedbacks. Spencer et al. (2007) and Spencer (2009) documented from satellite data analysis that cloud feedbacks are negative – basically invalidating the CO<sub>2</sub>-warming hypothesis.

On December 21st, 2006, Dr. David Hathaway of the Marshall Space Flight Center announced that Solar Cycle 24 would be one of the most intense cycles since recordkeeping began 400 years ago. The prediction was for a maximum sunspot number (SSN) peaking about the year 2010, at an SSN of 160, plus or minus 25. (Figure 5.4a) By April 2007 it appeared that Solar Cycle 24 was running late. It was then predicted to peak in mid-2011 or 2012 with an SSN of 90-125. Finally, in January, 2008 the arrival of Solar Cycle 24 was announced based on the appearance of a small sunspot of reverse polarity to that seen in previous Solar Cycle 23. Nevertheless, one year later, the sun remained quiescent with the fewest sunspot days recorded in the last century. (Figure 5.4b) There was a total of 266 sunspot-free days for the year, resulting in 2008 being the least active solar year since 1900 (Figure 5.5).

New data from the Solar Data and Climate Experiment (SORCE) shows that Total Solar Irradiance is now at its dimmest since records of TSI were established in 1978. The implications of these observations are that the climate should be cooling and, indeed, this has been observed. An abrupt cooling took place between January 2007 and January 2008, recorded by all of the world's global climate stations. Furthermore, the Globally Averaged Temperature recorded by Hadley Climate Centre (Figure 5.6) has declined significantly concurrently with the failure of Solar Cycle 24 to appear. If the sun remains in this dormant state, the world could be heading into a period of significant cooling analogous to the Dalton Minimum in the early 1800s.

There has been extreme reluctance on the part of IPCC to acknowledge a sun / climate connection, notwithstanding the documentation of many significant

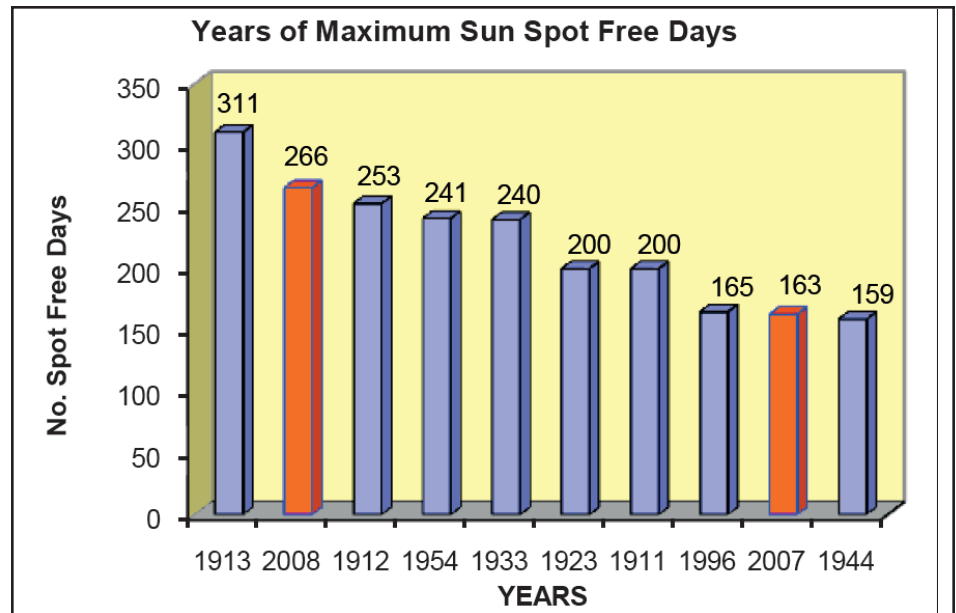


Figure 5.5. Chart showing the cumulative number of sunspot-free days in 2007 and 2008. The number of sunspot free days in 2008 is the highest since 1913. For most of the last century, cycles 16-23 have shown fewer spotless days as they reached their minima.

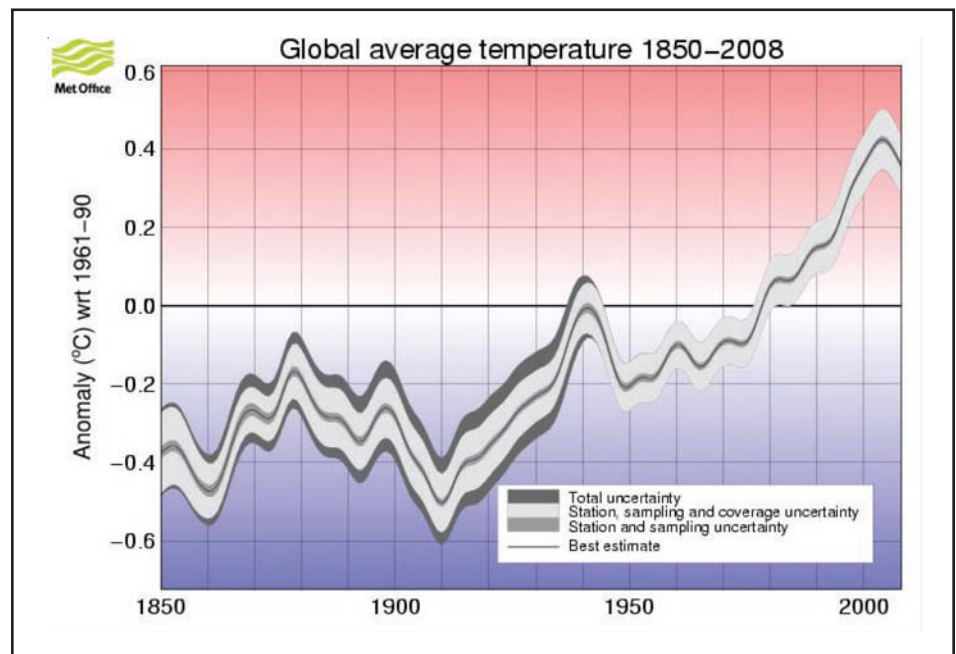


Figure 5.6. The Global Average Temperature 1850-2008. This data set shows that there has been no warming since 2000 and that there has been a significant temperature drop since 2007. The temperature decline is occurring in concert with the changes observed in the sun's energy output, both in sunspot number and in the AP energy index. The latter index shows a marked decrease as of October 2006 (source: Met Office Hadley Centre for Climate Change).

correlations, such as the correspondence of sunspot cycle length with global average land temperature. The IPCC principle dogma is that the variations in TSI are too small to have any influence on climate, although the TSI measurements have only existed for 30 years. This dogma is maintained despite the fact that the Maunder Minimum and Dalton Minimum are associated with periods of substantial and well documented cooling of

the world's climate. The fact that the precise mechanism is not understood does not negate the influence of the sun. When Friis-Christensen, a leading solar researcher, attended the initial IPCC meetings he was surprised to find that the committees refused to consider the sun's influence on climate as a topic worthy of investigation! The justification was that the IPCC mandate was to investigate man-made causes of climate



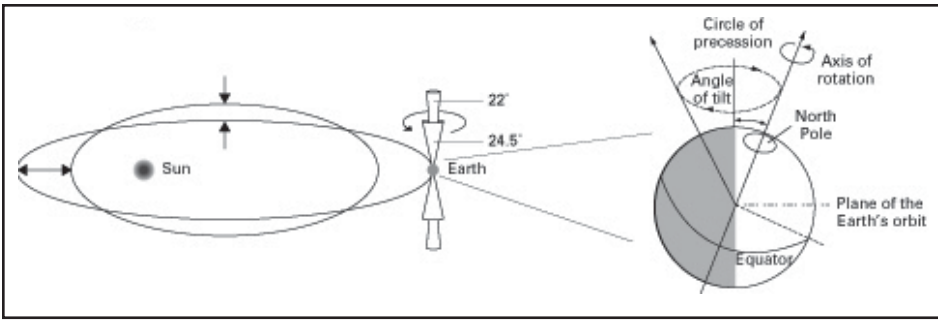


Figure 5.7. Diagrammatic representation of the orbital parameters of the Earth. The eccentricity of the orbit, the tilt of the axis of rotation, and the circle of precession as described in points 1, 2, and 3 in the text. (Source: [http://www.open.ou.nl/dja/klimaat/System/solar\\_radiation\\_and\\_milank.htm](http://www.open.ou.nl/dja/klimaat/System/solar_radiation_and_milank.htm)).

change. In other words, they wanted to confirm that human-released CO<sub>2</sub> was the cause of warming.

So far we have discussed the decadal and centennial effects of the sun's variability on climate as a result of the sunspot cycle and associated changes in TSI. What we will try to demonstrate next is that the sun's influence is complex and multifaceted, and that there are a variety of complex mechanisms altering the impact of the sun's energy on Earth. In the search for a mechanism that could explain the profound changes in climate resulting in the Earth's extensively documented glacial cycles, a Serbian astrophysicist, Milutin Milankovitch, developed a hypothesis that states that, as the Earth travels through space around the sun, cyclical variations in the axial attitude and orbit combine to produce variations in the amount of solar energy reaching the Earth. Milankovitch recognized three specific aspects of the Earth's attitude to the sun (Figure 5.7):

- 1). The shape of the Earth's orbit changes from elliptical (high eccentricity) to almost circular (low eccentricity) in a cycle that takes between 90,000-100,000 years. When the orbit is highly elliptical the amount of insolation (the total energy of the sun reaching the Earth) at the closest approach (perihelion) would be in the order of 20-30% greater than at the most distant point (aphelion), resulting in a much different climate than we experience today since the orbit is now almost circular.
- 2). The axis of the Earth's rotation is tilted and this tilt causes the changes in seasons from summer to winter. The tilt, however, changes over a period of about 40,000 years from approximately 22.1 to 24.5 degrees. Increased tilt means more severe seasons with warmer summers and colder winters while less tilt means colder summers and milder winters. The colder summers

are believed to allow snow and ice to accumulate in high latitudes building into massive ice sheets. The albedo (reflectivity) of the snow and ice causes more of the sun's energy to be directed back to space accelerating the cooling.

- 3). In addition to the tilt of the Earth's axis, it also has a wobble or eccentricity, not unlike the wobble of a spinning top as the spin decreases. This is known as precession and it changes the attitude of the Earth in its orbit. If a hemisphere is pointed toward the sun at perihelion, that hemisphere will be pointed away at aphelion, resulting in a more extreme difference in seasons. This seasonal

effect is reversed for the opposite hemisphere. Presently our northern summer occurs near aphelion.

From these relationships Milankovitch calculated a link between global ice volume and insolation resulting from variations in the Earth's orbit. He focused his analysis on summer insolation at 65 degrees north, reasoning that cooler summers might reduce summer snow melt, which would result in a positive accumulation of snow and ice and the development of ice sheets. Milankovitch's work was ignored for about 50 years and his theory was strongly criticized in the 1950s and 1960s by meteorologists, who argued that variations in insolation were insufficient to cause the changes he predicted. In 1976 his work was vindicated by the discovery that deep sea sediment cores did in fact correspond to periods of climate change as Milankovitch had theorized (Figure 5.8). In 1982 the US National Academy of Sciences commended the Milankovitch Cycle model as follows:

"...orbital variations remain the most thoroughly examined mechanism of climatic change on time scales of tens of thousands of years and are by far the clearest case of a direct effect of changing insolation on the lower atmosphere of the earth." (National Research Council, 1982).

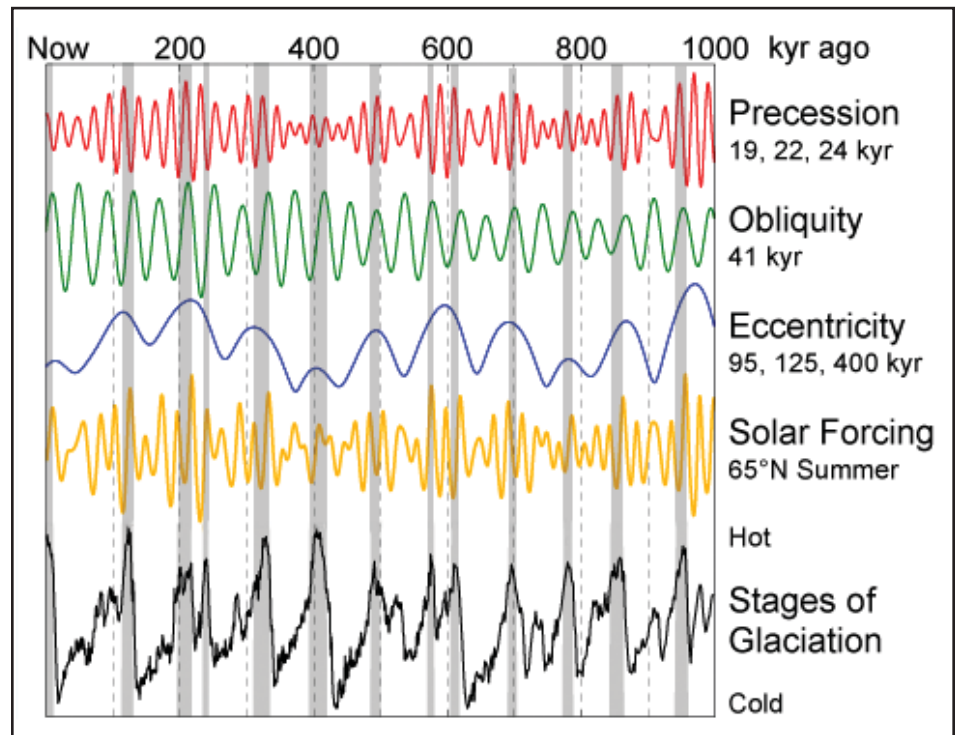


Figure 5.8. A diagram summarizing the effect of the Milankovitch Cycles in the last million years. The bottom curve plots the stages of glaciation which have a rather regular 100-year periodicity, corresponding, in turn, to the peak eccentricity of the Earth's orbit. Just as striking, however, are the regular 15-20,000-year warm periods. Most observers looking at this periodic cycle would conclude that we may very well be reaching the end of the current warm cycle although presently the Earth's orbit has low eccentricity (nearly circular) (Source: Orbital data - Quinn et al. 1991; glacial cycles - Liseiecki and Raymo, 2005).



Nevertheless, Milankovitch's work has fallen out of favour once more, since climatologists are reluctant to concede a role for the sun and prefer to discount variations in insolation as having a material effect on climate. Most of the current criticisms are based on lack of an ideal perfect fit to the predicted cycles. This assumes, of course, that there are no other factors influencing the climate during the periodicity of the Milankovitch Cycles which, as we will discuss, is not the case. The sunspot cycle undoubtedly has an influence but this occurs over a shorter time frame than the major glacial cycles.

A number of researchers have studied longterm patterns of sunspot cycles in order to detect longer-term trends. Commonly the approach is to run an autocorrelation analysis to detect statistically significant cycles. (e.g., Cole, 1973; Neftel, Oeschger, and Suess, 1981). Typically such studies identify a 200-year cyclicity in minima to maxima of the sun's 11-year sunspot cycle.

Khabibullo Abdussamatov (2007), a Russian space researcher, also determined that sun spots occur in 200-year cycles. For example, he regards the period of the Medieval Warm Period to the conclusion of the Little Ice Age (LIA) as the first 200-year cycle. The second cycle is from the end of the LIA until the present. (Figure 5.9). Abdussamatov attributes the lag in cooling to the thermal inertia of the oceans, which have an immense heat capacity, and have been warmed significantly during the 20th Century. As Figure 5.9 suggests, Abdussamatov's projections may prove to be accurate since he records a sharp dropoff in the year 2000, with a minima at or before the year 2040. The current behaviour of the sun is actually lower than the Abdussamatov forecast and indicates that we may be entering a period of global cooling. The projections are not based on analysis of individual sunspot cycles, but on observations of the solar radius, which is directly related to solar activity. It was noticed during the Maunder minimum of the LIA, that the quiescent sun's radius decreased significantly, thus the measure of solar radius and its behaviour provides a guide to broader cycles of the solar activity. Recently released data indicates that the Total Solar Irradiance and the Average Planetary Magnetic Index (AP) are declining, and are now at the lowest levels since the 1930s when recording started (Figure 5.10).

The AP index is designed to measure solar particle radiation by its magnetic effects and provides a measure of the sun's magnetic field, the heliosphere. The heliosphere is the result of a constant stream of charged particles, the solar wind, emanating from the

sun, which extends the sun's magnetic field far into space. The solar wind was discovered in 1958, and space probes now show that it extends far beyond the sun and the solar system into interplanetary space. To provide some measure of the scale of the heliosphere, light or any unimpeded cosmic particle will take some 20 hours to travel from the outer limit of the heliosphere into the centre of the solar system, compared to eight minutes for light from the sun to reach the earth. So, not only does the sun provide us with its energy, but the heliosphere is like a giant umbrella protecting us from a potentially devastating rain of cosmic energy (Figure 5.11, page 26). The boundary of the heliosphere fluctuates according to surges of cosmic energy and the competing energy of the solar wind.

Approximately 50-70% of incoming cosmic radiation is deflected by the heliosphere, with the remaining cosmic energy reaching the Earth, where it is, in part, deflected by the magnetic field. In the atmosphere, primary particles are to a large extent brought to halt in collisions. The release of energy yields millions to billions of secondary particles that dissipate steadily towards sea level. Measurements indicate that cosmic rays show a 25-30% decrease following periods of high sun-spot counts when the solar wind is strong. Therefore, there is a link between the sun's TSI and its deflection of cosmic energy, which has significant effects on Earth's climate.

This new scientific field of cosmo-climatology was started by a pioneering paper in 1991 by

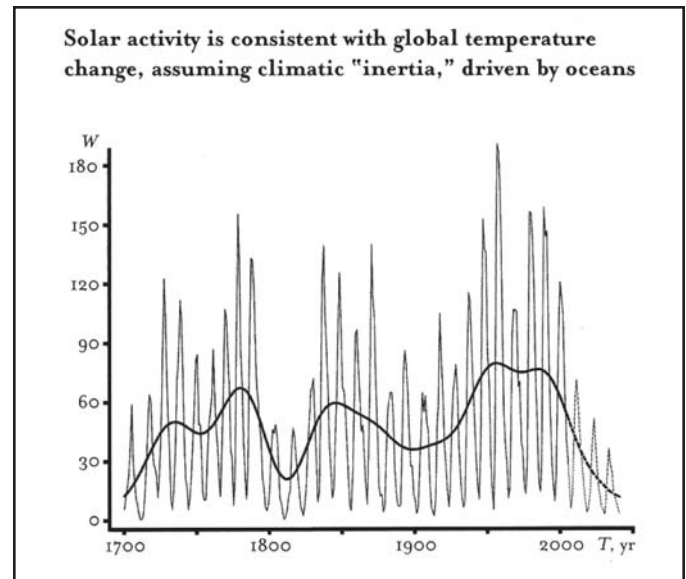


Figure 5.9. Solar activity from 1700 with Abdussamatov's projections beyond the year 2000. According to the author, the sun is at the end of a 200-year solar cycle. The continuation of warming is attributed to the thermal inertia of the oceans as a result of warming during the 20th Century. Beyond 2000, the author forecasts a sharp decline in solar activity. The peak at the year 2000 is Sunspot Cycle 23 and that Abdussamatov's forecast for Cycle 24 (made in 2006) is lower than the most recent projection from NOAA in January 2009. On this basis, the analysis of the solar radius has greater predictive ability for the variability of the solar cycle (Source: Solomon, 2008).

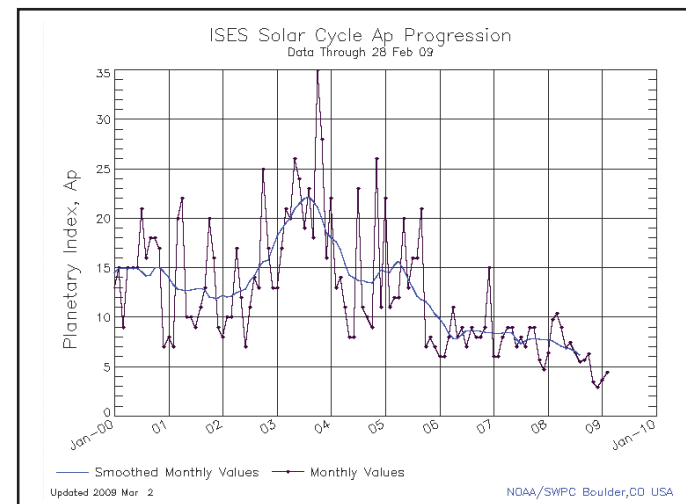


Figure 5.10. This graph shows the progression of the Average Planetary Magnetic Index which is a measure of the solar particle radiation by its magnetic effects. The Index shows a significant decline with a distinct step in October 06 to values ranging from 7-8. Since then, there has been a further sharp decline to values of 3 or 4, the lowest ever recorded. All of this suggests that the sun has made a transition from a very active cycle to an inactive period. This may have the characteristics of a Dalton Minimum of the 1800s (Source: NOAA/ SWPC, Boulder, Colorado).

Friis-Christensen and Lassen in which they documented a close relationship between solar activity and the surface temperature of the earth (Figure 5.12, page 26). Subsequently, in 1997, Svensmark and Friis-Christensen, in a landmark paper, documented a relationship between global cloud coverage and cosmic ray flux. These



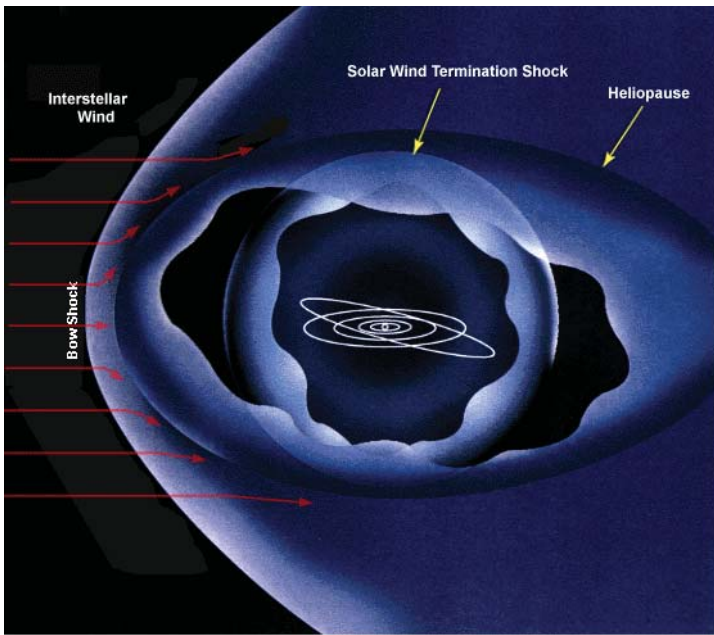


Figure 5.11. An illustration of the Heliosphere in relation to the solar planetary system and interstellar space. Variations in the sun's activity will result in expansion or contraction of the Heliosphere which is also modulated by the strength of the cosmic flux of the interstellar wind (Source: NASA Basics).

findings were expanded by Marsh and Svensmark in 2000, describing the manner in which low cloud properties, in particular, are influenced by cosmic rays. Figure 5.13 shows a quite remarkable correlation between the changes in the cloud cover in the troposphere and the associated variation in cosmic radiation intensity in the period from 1984-1994. One can readily see that the more cosmic rays enter the troposphere, the more cloud develops. Cosmic rays ionize the molecules of the atmosphere transforming them into condensation nuclei for water vapour.

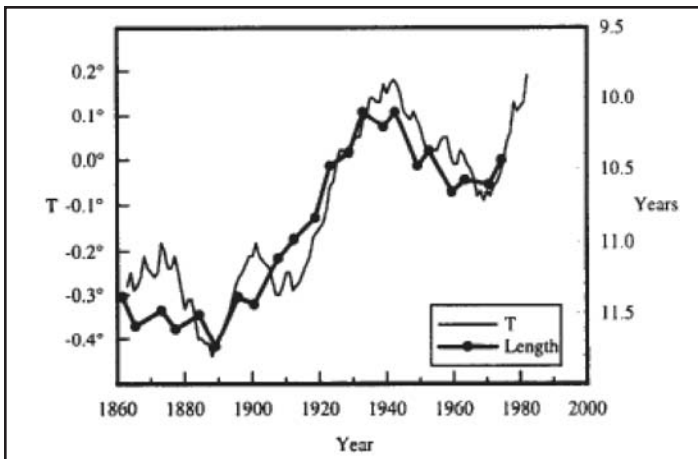


Figure 5.12. A plot of the sunspot cycle length versus the Northern Hemisphere land temperature that shows a remarkably good correlation over the last 130 years. On average, cycles are eleven years but it is known that the cycles are shorter when activity is strong and are longer when activity is weak. Although this correlation is convincing that there is a sun-Climate link it has been systematically ignored by IPCC (Source: Friis-Christensen and Lassen, 1991).

I think we can say that these findings were greeted by hostility from the promoters of Anthropogenic (man-made) Global Warming theory. It would be fair to say that there was a deliberate attempt to discredit Svensmark's research and to forestall approval of funds to determine experimentally the nucleation of clouds by cosmic rays. It was, therefore, not until 2006 that Svensmark and his team was able to embark on an experiment in which a reaction chamber the size of a small room was constructed in the basement of the Danish National Space Center. The gases in the chamber mimicked the chemistry of the lower atmosphere. Naturally occurring cosmic rays entered through the ceiling. The result demonstrated quite conclusively that cosmic rays induced and catalyzed cloud condensation nuclei. The intensity of the reaction surprised the investigators who had expected only a moderate response. This confirmed Svensmark and his collaborators' interpretation that quite small changes in cosmic radiation could have a significant

effect on climate through the promotion of cloud cover (see Svensmark and Calder 2007, "The Chilling Stars" for an excellent review on cosmo-climatology).

So now it is apparent that there is a feedback mechanism associated with the sun's drop in energy output and the production of aerosols, the precursors for the formation of cloud droplets, by interaction of cosmic rays in the troposphere. Although the decline in observed TSI may be small, it signals a drop in the energy of the solar wind and a greater influx of cosmic rays. This in turn produces more cloud and lowered temperatures. Climate models only include the effects of the small variations in the direct solar radiation without the feedback effects of cosmic rays on clouds. Also, as already discussed in an earlier article, the work of Spencer (2009) demonstrates that the model feedback assumptions are wrong in the first place,

The other element in this great clash of cosmic energy is the variability and intensity of cosmic rays. The greatest generation of cosmic rays comes from stellar explosions called supernovae which occur about once every 50 years in a galaxy such as the Milky Way. They cause a brilliant luminous burst of radiation which briefly may outshine an entire galaxy before fading in a few weeks or months. During this brief interval, a supernova can radiate as much energy as the sun in its entire life span (Giaccobe, 2005). The explosion expels most of the stellar material at a velocity at up to one-tenth of the speed of light, driving a shock wave through the interstellar medium.

Nir Shaviv, an Israeli physicist, working on

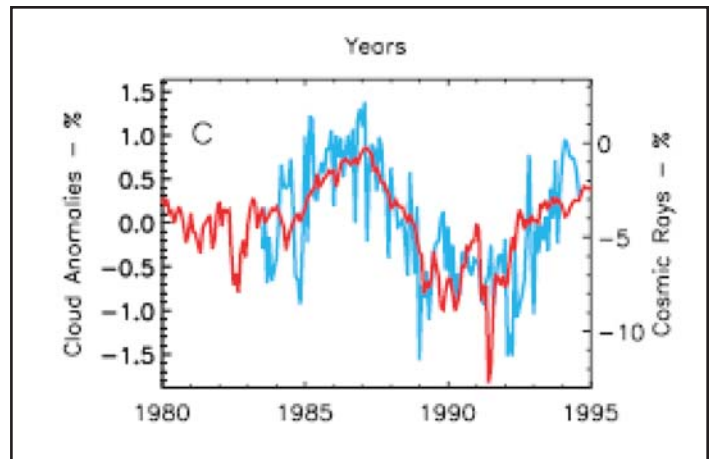


Figure 5.13. This diagram was developed by observing the changes in cloudiness as observed by geostationary satellites and comparing this with the variations in cosmic radiation. The coincidence of the changes in the cloud cover with the changes in cosmic radiation intensity is remarkable and provides compelling evidence of the sun's role in the cosmic ray cloud feedback system (Source: Marsh and Svensmark, 2000).

Figure 5.14. A comparison of the Cosmic Ray Flux (CRF) constructed from iron meteorite exposure data (Shaviv, 2002b). The blue line depicts the nominal CRF, while the yellow shading delineates the error range. The other curves denote other CRF reconstructions leading to the final fine-tuned blue reconstruction. The bottom black curve depicts a statistically smoothed curve of temperature spanning 500m.y. (Veizer et al., 2000). The red line is the model reconstruction for temperature based on the CRF flux (red line upper). The blue bars at the top represent cool climate modes with established polar ice caps (icehouses) while the white bars represent times of warmth (greenhouses) as developed from sedimentological criteria (Frakes and Francis, 1998; Frakes et al., 1992). The figure demonstrates that the 'icehouses' and oxygen isotope cold intervals coincide with times of high CRF production, while the greenhouse intervals are characterized by low CRF episodes (Source: Shaviv and Veizer, 2003).

iron meteorites noticed that some samples displayed extensive cosmic ray damage while others were little affected. What he determined was that meteorites sustained 2-5 times the damage, while traveling through the spiral arms of the Milky Way Galaxy, as they did in the relatively empty space between the spiral arms (Shaviv, 2002).

This seemed logical since the supernovae, the source of cosmic rays, are most likely to be located in the spiral arms. Our Milky Way Galaxy is a disc-like body with curved arms radiating from its centre and, through time, the solar system travels through the galaxy. The solar system revolves around the galaxy's centre so that every 135 million years (plus or minus 25 million years) we should expect a colder climate as the solar system passes through a spiral arm. Within the spiral arm, the cosmic ray density would be sufficient to change Earth's cloud cover by 15% – more than enough to change the state of the Earth from a hothouse with temperate climates extending to the polar regions, to an ice house with extensive polar ice caps. Shaviv argues that cosmic ray fluctuations explain more than two-thirds of Earth's temperature variations, and on geological time scales, are the most dominant climate drivers. This conclusion is based on the comparison of cosmic ray flux variations compared to a reconstruction of temperature derived from studying oxygen isotope in the shells of fossils from tropical oceans (Veizer, 2000; Shaviv and Veizer, 2003). The results of this comparison are presented in Figure 5.14 where the match of cosmic ray flux with reconstructed temperature is close to a 100% correlation, leaving little room for other potential climate drivers such as CO<sub>2</sub>. Furthermore, when comparison of reconstructed CO<sub>2</sub> values (GeocarbIII; Berner and Kothvala, 2001; Berner and Streif, 2001; Rothman, 2002) is made with

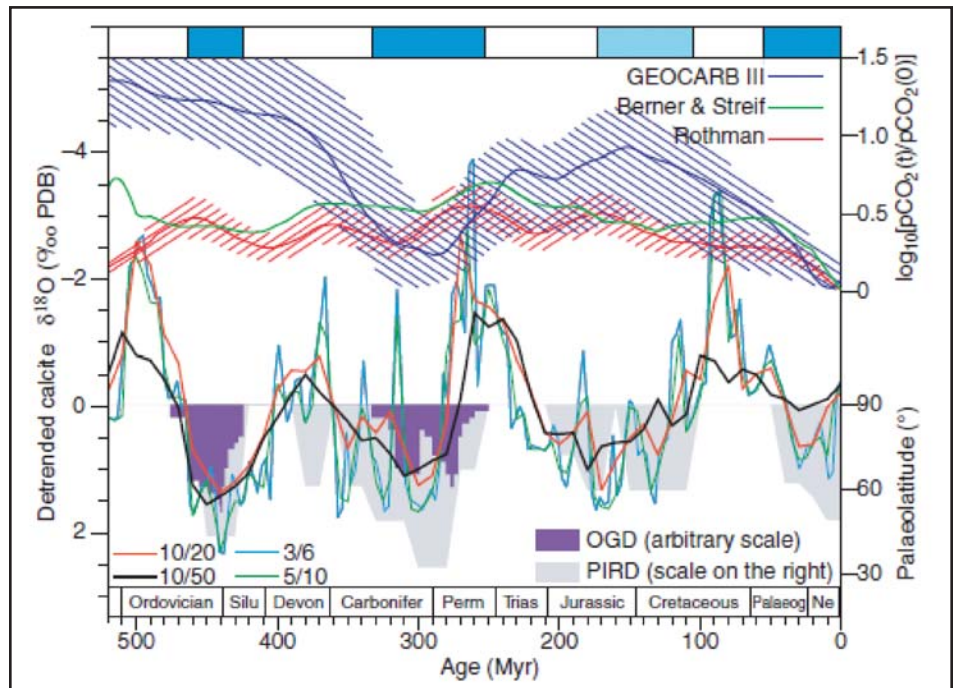
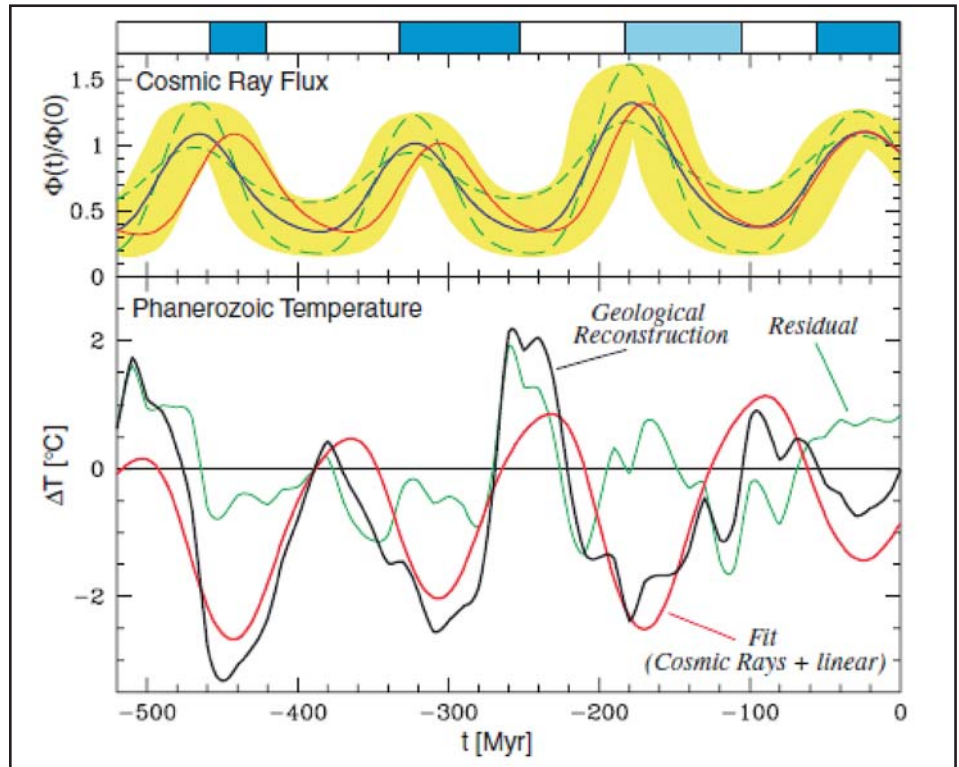


Figure 5.15. Climate indicators for Phanerozoic geological epochs derived from oxygen isotope ratios plotted with the reconstructed partial pressure of CO<sub>2</sub> (pCO<sub>2</sub>) levels. The bottom set of curves are the running means for various filters as indicated bottom left and yield a proxy for temperature. The shading on the bottom curves reflects the distribution of glacial deposits (OGD) and the paleolatitudinal deposits of ice-rafted debris (PIRD). The blue and white bars are as described in Figure 5.14 reflecting cold or warm climates. The upper set of curves outlines the reconstructed histories of past pCO<sub>2</sub> variations (data from Geocarb III by Berner and Kothvala, 2001; Berner and Streif, 2001; and Rothman, 2002). Cross-hatching reflects error range in the reconstructions. It is clear on the basis of this data set that CO<sub>2</sub> has no significant correlation with Phanerozoic climate (Source: Shaviv and Veizer, 2003).

Phanerozoic climate trends, the correlation is poor (Figure 5.15). Possibly CO<sub>2</sub> reconstructions can be improved, but the

high correlation with celestial drivers indicates that CO<sub>2</sub> can not have a significant role in climate variability over geological



time scales. The fundamental problem is that there is no natural system that can act over geological time scales to add or remove CO<sub>2</sub> from the atmosphere. The oceans are the main reservoir of CO<sub>2</sub> so that in cold cycles atmospheric CO<sub>2</sub> should be reduced, and increased as the ocean warms. Therefore changes in atmospheric CO<sub>2</sub> follow climate change.

What emerges from this review is that climate is subject to a series of cycles operating on different time scales but modulated by the activity of the sun and its interplay with the Cosmic Ray Flux. On short time scales of decades and centuries, the sun spot activity, together with negative feedback from cosmic ray flux, are the principal climate drivers inducing the modulation of our current warm period, and the historic variation indicated by the Little Ice Age, Medieval Warm Period, Dark Ages Cooling, Roman Warm Period, etc.. On the scale of millennia are the Milankovitch Cycles where changes in insolation related to the attitude and proximity to the sun cause glaciation with a distinct 100,000 year or 40,000 year periodicity. Finally there is the millenary celestial cycle with a period of 143 (plus or minus 10 million years) as the sun travels through the Milky Way Galaxy, changing the Earth's climate from icehouse to greenhouse with the modulation of the Cosmic Ray Flux. If CO<sub>2</sub> has any role in this cosmic journey it is very minor and probably co-incident.

## REFERENCES

- Abdumassatov, K. I. 2007. *Optimal Prediction of the Peak of the Next 11-year Cycle and of the Peaks of Several Succeeding Cycles on the Basis of Long-Term Variations in the Solar Radius or Solar Constant*. *Kinematika i Fizika Nebesnykh, Tel* 23, no. 3.
- Berner, R.A. and Kothvala, Z. 2001. *GEOCARB III: A revised model of atmospheric CO<sub>2</sub> over Phanerozoic time*. *American Journal of Science*, v. 301 p. 182-204.
- Berner, U. and Streif, H. 2001. *Klimafakten Der Ruckblick Ein Schlüssel fur die Zukunft*. Stuttgart, Science Publishers, 238 p.
- Cole, T.W. 1973. *Periodicities in Solar Activity*. *Solar Physics*, v. 30.
- Frakes, L. A. and Francis, J. E. 1988. *A guide to Phanerozoic cold polar climates from high latitude ice rafting in the Cretaceous*. *Nature*, v. 33, p. 547-549.
- Frakes, L. A., Francis, J. E., and Syktus, J. I. 1992. *Climate modes of the Phanerozoic; The history of the Earth's climate over the past 600 million years*. Cambridge, Cambridge University Press, 286 p.
- Friis-Christensen, E. and Lassen, K. 1991. *Length of Solar Cycle: An Indication of Solar Activity Closely Associated with Climate*. *Science*, v. 254, no. 5032, p. 698-700.
- Giacobe, F.W. 2005. *How a Type II Supernova Explodes*. *Electronic Journal of Theoretical Physics* v. 2, no. 6, p. 30-38.
- Intergovernmental Panel on Climate Change. 2007. *Climate Change: Historical Overview of Climate Change Science. Fourth Assessment Report*. Geneva, Switzerland.
- Lisiecki, L. E. and Raymo, M. E. 2005. *A Pliocene-Pleistocene stack of 57 globally distributed benthic Oxygen 18 records*. *Paleoceanography*, v. 20, PA1003.
- Marsh, N. D. and Svensmark, H. 2000. *Low Cloud Properties Influenced by Cosmic Rays*. *Physical Review Letters*, v. 85, p. 5004-5007. Milankovitch, M. (see: [www.earthobservatory.nasa.gov/Features/Milankovitch](http://www.earthobservatory.nasa.gov/Features/Milankovitch)).
- Neftel, A. Oeschger, H. and Suess, H. E. 1981. *Secular Non-random Variations of Cosmogenic Carbon 14*. *Earth and Planetary Science Letters* v. 56, no. 12, p. 127-137, 141-147.
- Quinn, T. R., et al. 1991. *A Three Million Year Integration of the Earth's Orbit*. *The Astronomical Journal*, v. 101, p. 2287-2305.
- Rothman, D. H. 2002. *Atmospheric carbon dioxide levels for the past 500 million years*. *Proceedings of the National Academy of Sciences*, v. 99, p. 4167-4171.
- Shaviv, N. J. 2002a. *Cosmic ray diffusion from the galactic spiral arms, iron meteorites and a possible climate connection?* *Physical Review Letters*, v. 89, 051102.
- Shaviv, N. J. 2002b. *The spiral structure of the Milky Way, cosmic rays, and ice age epochs on Earth*. *New Astronomy*, v. 8, p. 39-37.
- Shaviv, N. J. and Veizer J. 2003. *Celestial Driver of Phanerozoic Climate*. *GSA Today*, v. 13 no. 7, p. 4-10.
- Spencer, R.W. 2009. *Satellite and Climate Model Evidence against Substantial Man Made Climate Change*. In Press. *Journal of Climate*, also at [www.drroyspencer.co](http://www.drroyspencer.co).
- Svensmark, H. 1998. *Influence of cosmic rays on Earth's climate*. *Physical Review Letters*, v. 81, p. 5027-5030.
- Svensmark, H. and Calder, N. 2007. *The Chilling Stars: A Cosmic View of Climate Change*, Icon Books Ltd. U.K.
- Svensmark, H. and Friis-Christensen, E. 1997. *Variations in Cosmic Ray Flux and Global Cloud Coverage – a Missing Link in Solar Climate Relationships*. *Journal of Atmospheric and Solar-Terrestrial Physics*, v. 59 p. 1225-1232.
- Veizer, Jan. 2003. *Celestial climate driver: a perspective from four billion years of the Carbon cycle*. *Geoscience Canada*, v. 32, p. 32-3



# CLIMATE CHANGE VI:

## *Fearmongering*

by Dr. A. Neil Hutton

There is an endless litany of misinformation disseminated by those espousing human induced warming. So much so that it will not be possible to refute all of the erroneous claims within this article. The list is long: melting icecaps, retreating glaciers, rising sea level, and ocean acidification; “the spin cycle” of more hurricanes, tornadoes, and cyclones; desertification and droughts; floods and torrential rains; animal extinction; and finally, spreading disease and death. The worst offenders in all of this are our media, (print, wireless, and visual) who happily regurgitate every sensationalized and exaggerated claim attributed to the cause of anthropogenic global warming (AGW). The data, if the media was alert and competent, is only a few mouse clicks away, so that, with very little effort, the facts can be easily checked. Much of the information is a matter of public record, and the vast majority of the claims can easily be discredited. The remainder is grossly exaggerated.

Perhaps one of the most egregious sources of misinformation is the Gore documentary, “An Inconvenient Truth.” Very recently, the British High Court decided that the film was unsuitable to be shown in the British Schools because of at least nine errors of fact, and the high level of misleading and exaggerated statements. Nonetheless, our public broadcaster, CBC, has this year seen fit to screen the Gore film without disclaimer or any presentation of balance to the exaggerated claims. In the plethora of misleading hype in the media, Gore’s movie hit on all of them, no fewer than 35 false or erroneous claims documented by Moncton (2007) following the High Court case.

The National Geographic Magazine is a fine publication but it is equally as guilty as Gore in producing seriously misleading articles on Climate Change. An article in the June 2007 issue is a case in point. Entitled “The Big Thaw,” the article retreads all of the unwarranted claims contained in the Gore movie:

“A Global Retreat: Ice is on the run in its mountain and polar strongholds. As the ice sheets on Greenland and Antarctica shrink in the next few centuries, seas could rise 20 ft. (6.1 m). The shrinkage of mountain glaciers will dry up rivers and alter landscapes.”

The first problem is the assumption that climate should not change when in reality it is continuously cyclical, with well documented historic warm periods in which temperatures matched or significantly exceeded our current warmth. The kind of apocalyptic claims made above simply are not supported by the evidence.

Also, the cyclical advance and retreat of glaciers with climate is well documented from historical and archaeological records. It is very clear that the Earth has been in a warming cycle since the end of the Little Ice Age in the middle of the nineteenth Century. We should expect that glaciers will retreat after 150 years of warming – this is natural and cyclical, and is well illustrated by the Schnidejoch Glacier in the Swiss Alps (Svensmark and Calder, 2007). Artifacts have been recovered in the pass as the Glacier retreats indicating that during warm periods the Schnidejoch Pass was used by travelers to cross the Swiss Alps. The earliest artifact is a birch quiver dated to the close of the Holocene Climate Optimum (4,700 years ago), and more than 300 items indicating extensive use of the pass in the Roman and Medieval Warm Periods. Warming and associated glacial retreat are natural processes and are not in themselves an indication of adverse or human-induced climate change.

The history of the Schnidejoch Glacier’s advance and retreat is replicated for glaciers throughout the world. While people are being told that they are responsible for glacial retreat, consider the dread of people in the path of advancing glaciers during the Little Ice Age:

“The year was 1645, and the glaciers in the Alps were on the move. In Chamonix at the foot of Mont Blanc, people watched in fear as the Mer de Glace glacier advanced. In earlier years they had seen the slowly flowing ice engulf farms and crush entire villages.”

The people turned to the Bishop of Geneva for help, and, at the ice front a rite of exorcism was performed. Little by little the flow ceased and, the glacier receded. Similar dramas unfolded throughout the Alps, Scandinavia and Iceland during the late 1600s and early 1700s” (Smithsonian Archives).

Nevertheless, the hype continues. The New York Times, 19th February, 2001 edition had an article stating:

“The icecap atop Mount Kilimanjaro, which for thousands of years floated like a cool beacon over the shimmering plain of Tanzania is retreating at such a pace that it will disappear in less than fifteen years, according to new studies.”

This is a classic overstatement from the press. What the study actually showed was that between 1912 and 1953, when surveys were completed, the snow cap lost 45% of its areal extent. This snow loss occurred during a period of warming before the industrial output of CO<sub>2</sub> could have had any significant role (Thompson et al., 2002). At this rate of loss (10% per decade) it would be fair to say that by the year 2000 the snow cap would be gone. However, the snows of Kilimanjaro remain and the rate of loss has declined considerably. Satellite data, since 1979, indicate that the mountain temperature as recorded by accurate satellite data has declined by 0.22°C. Nevertheless, the glaciers continue to retreat. In order to maintain a glacier’s areal extent, there has to be a balance between winter precipitation such that added snow cover will equal summer melt. The decline in Kilimanjaro’s ice cap is the result of a significant decline in precipitation in the last Century, not global warming.

The Great Arctic Meltdown, as reported in the National Geographic Magazine quoted above and also in the New York Times states, “Arctic Ice is Melting at Record Levels, Scientists Say”. Of course all of this is attributed to AGW. There is abundant data to demonstrate that the reported conditions are not without precedent. Arctic temperatures were significantly warmer in the 1930s and 1940s as shown by Polykov et al. 2003 (Figure 6.1, page 30). Although Arctic Ice cover has been decreasing in recent decades, especially in the summer of 2006, there has been a significant rebound subsequently. It is difficult to explain this behaviour on the basis of Arctic air temperature, which has shown no significant variation in summer temperatures since 1958 (Polykov et al., 2003). A mild trend of warming has been identified in the winter but this has no effect since it is much too



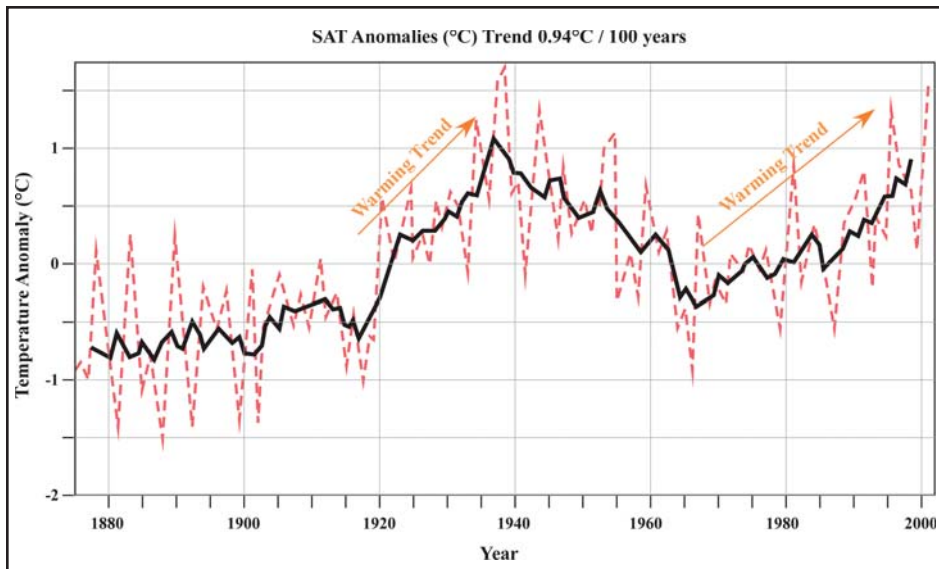


Figure 6.1. The bold line is the six-year running mean of Arctic temperature (after Polykov et al. 2003). The dashed line is the annual temperature. Two distinct warming periods are clearly evident from approximately 1915 to 1945 and from 1970 to 2000. Compared to the global and hemispheric temperatures, the Arctic temperature increase was stronger in the late 1930s and early 1940s than in recent decades. The warming of the 1930s occurred at a time before greenhouse gases could have caused significant warming.

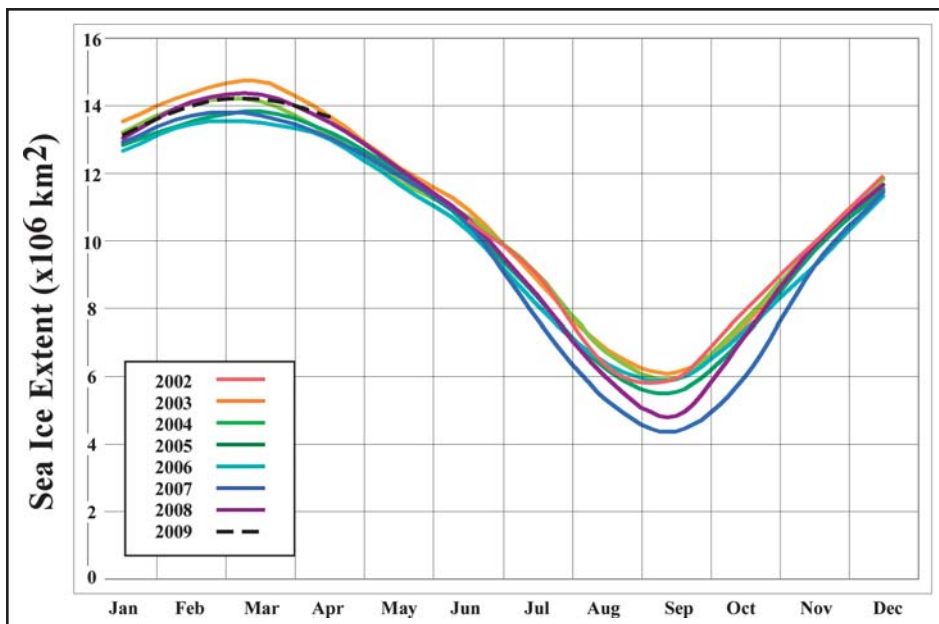


Figure 6.2. A graphical presentation of the areal extent of sea ice in the Arctic Ocean. The maximum this century occurred in 2003 and the minimum in 2007. The sea ice area has been increasing since 2006, and 2009 appears on trend likely to exceed all years since 2004. As of April 2009, the sea ice extent matched the levels of 2002 and 2003 (data summarized from NASA Earth Observatory).

cold at that time for ice to melt. To achieve this rapid melt of Arctic pack ice requires changes in oceanic circulation.

Polykov and Johnson (2000) identify several oscillatory modes in Arctic Climate. The decadal Arctic Oscillation and an associated Low Frequency Oscillation with a time scale in the range of 60-80 years are both strongly linked to the North Atlantic Oscillation. These climate oscillations result in fluctuations in the thermohaline circulation

between the Arctic basin and the North Atlantic with a strong impact on Arctic ice pack variability. In the winter of 2008-2009, the Arctic Ice pack returned to the same levels observed in 2001.

The threat of losing the Polar Ice Pack was raised in the Gore Film and was also made in the Third Assessment Report of IPCC, where it was claimed that there had been a 40% decline in the thickness of polar pack ice. This conclusion was based on a profile of 29

measurements taken by US Nuclear Submarines (Rothrock et al., 1999). As it turned out, the profile, through the central Arctic, was conducted at a time when prevailing winds and ocean currents had moved the ice out of the profile areas such that the extrapolation of the limited data to the entire Arctic grossly exaggerated the ice loss. Subsequent research by Holloway and Su in *The Journal of Climate* (2002), demonstrated that because of the biased sampling the ice loss was not 40%, as trumpeted by the media, but only 15%. This remarkable recovery of the Arctic Ice mass received no media coverage whatsoever. Meantime, the Gore documentary continues to be shown – claiming a 40% ice loss. It is not stated, but implied, that this would elevate sea level. The fact is that even if the Arctic Ice disappeared entirely it would not affect sea level.

In order to change sea level, to any significant degree, it is necessary to actually melt the land-fast ice caps of Greenland and Antarctica. For both of these land masses, the temperature records show that they are not warming. A very thorough study by Hanna and Cappelin (2003) shows that the surface records in southern Greenland, potentially the most sensitive area of the Ice Cap, have been cooling since 1958, and the sea surface temperature demonstrates a similar trend. In fact, the southern coastal stations of Greenland show a drop of 1.27°C. Nevertheless, in the June 2007 National Geographic article, it is claimed that ice sheets covering Greenland are shrinking unexpectedly fast and the outlet glaciers that carry ice to the sea are accelerating. Shrinking and accelerating are contradictory terms so far as glaciers are concerned. The outflow from a glacier is not dependant on air temperature but on the accumulation of snow pack at the highest elevation of the glacier. Krabill, in 1980, indicated a thickening of up to seven feet on the Greenland ice cap and, again in 2000, with a number of coauthors, reported that the main mass of the glacier above 6,500 feet is rising at about 0.2 inches per year. Part of this may be attributable to isostatic rebound, due to the unloading of the continental ice sheet, of which Greenland was a part. But the conclusions of Krabill and his colleagues was that the whole region has been in balance.

Glaciers flow under their gravitational load so that the flow rate is a function of the accumulation of the snow pack. If precipitation is high the glacier will accelerate but if it decreases then the glacier flow will slow. At its termination the movement of the glacier is a function of the ambient air temperature. If summer temperatures are high, and glacial advance is

slow, then the glacier will retreat. If the glacier advances, it implies that the load of the snow pack at high elevations is greater than the rate of melting. Therefore, the Greenland Ice Sheet would appear to be in a healthy balance. Also, warming can have a contrary effect on an ice cap, since it may actually increase the amount of precipitation as warmer air encounters subzero temperatures of the ice cap at high elevations.

The suggestion in the National Geographic article is that, during summer melt, the high levels of surface water – temporary ponds and surface lakes – will fracture the ice and drain down through to the glacier base and lubricate its flow. The authors of this idea do not seem very familiar with the erosive power and characteristics of an active glacier. The base of a glacier is charged with rocks and debris stripped from its base and frozen into the ice mass so that it resembles a giant rasp constantly tearing, grinding, and eroding its base and the sides of the valley. Meltwater simply can not reach the frozen base of the glacier before becoming so charged with debris and rock flour that it flows within the ice-forming internal stream deposits above the rock floor.

As glaciers retreat they leave extensive deposits of fluvio-glacial material, eskers (stream deposits), kames (internal deltas), and terminal and lateral moraines. The U-shaped valleys and the mass of these deposits is a testament to the erosive power of the glacier. The downward motion of the glacier is the result of the relentless power of gravity which comes from the elevation of the snowfield accumulation area over the exit point, which, in this case, is sea level. Moreover, the base of the glacier is a zone of permafrost extending into the underlying soil and rock. There is no potential slip or glide plane that can lubricate the glacier's movement. The actual glacier flow velocity is still controlled by the vertical mass of ice above the glacier's baseline. If the velocity of flow of the terminal portion of the glacier somehow exceeds the normal gravitational flow rate, it should result in a large crevasse or series of major crevasses at the transition from the natural upper glacier flow, to the so-called accelerated water-lubricated zone. This has never been reported.

The entire thrust of the claims of Greenland Ice Cap accelerated melting are advanced in order to support extremely exaggerated claims of sea level rise – 20 feet (6.1 meters) in the National Geographic article above. Greenpeace has trumpeted levels of 5-7 meters (16-23 feet), potentially correct if the entire ice sheet were to disappear, but even the IPCC do not subscribe to this level

of loss. The Third Assessment Report attributes only -0.02 to 0.09 meters (-0.78 to 3.5 inches) in the next 100 years. Therefore, IPCC recognized the possibility that melting of the Greenland Ice Cap may actually reduce sea level. As Krabill's research indicates, the ice loss on Greenland is a mere 0.13mm/year or only 1.3 centimeters (0.5 inches) after 100 years. This is a very far cry from the Greenpeace and National Geographic exaggerated claims of 20ft (6.1m), which would require 4 millennia to achieve at present melt rates.

In Antarctica, a very similar picture exists – temperatures have been declining since the 1960s as reported by Doran (2002), Jones (1995), and Sansom (1989). Since 1979 the microwave sounder units on NASA satellites record declining temperatures. Nevertheless, Gore and others have made much exaggerated claims regarding glacial calving in blocks the size of Rhode Island from the west Antarctic Peninsula. The peninsula is like a thumb trending northwest towards Argentina. Because of past sea level rise, the ice is anchored only on a small number of islands. It is underlain by ocean and so is less stable than the main mass of Antarctica. The west peninsula does not show the same range of cooling as east Antarctica but, as we have discussed, air temperature in itself, does not determine glacial behaviour. It is a simple matter to review the ice areal extent maps showing the ice is expanding and thickening (Figure 6.3, page 32). Currently, the ice mass is at record levels (see <http://arctic.atmos.uiuc.edu/cryosphere/>). What is the evidence for the National Geographic statement: "If vulnerable parts of the ice that blankets Greenland and Antarctica succumb, rising sea levels could flood hundreds of thousands of square miles – much of Florida, Bangladesh, the Netherlands – and displace tens of millions of people". What credibility can be given to this extraordinary claim? The critical word is "if" but what is the real probability? The Greenland Ice Cap has survived the previous warming cycles and is still well beyond its position at the time of the Danish settlements in the Medieval Warm Period (Tkachuck, 1983, p. 2). The evidence shows that Antarctica is cooling but it seems that the less evidence there is, the more shrill and exaggerated are the claims. A case in point is the fact that Michael Mann (the author of the now-discredited temperature hockey stick) and colleagues are now attempting to show, by statistical manipulation, that Antarctica is actually warming, a premise of which even other global-warming activists are skeptical.

Sea level rise is always a good subject to get people's attention, especially with the

number of heavily populated coastal cities. Aside from the hysteria of improbable sevenmeter increases, what is really known? In 1990, the IPCC predicted that man-made warming would result in an increase of 30 to 100 cm, (12 to 39 inches) but by 2001 this estimate was lowered to 9-88 cm, (3.5 to 34.6 inches) and by 2007 in the IPCC fourth assessment, given the oceans' lack of response, was reduced to 18 and 59 cm, (7 to 23.2 inches), an approximately 50% reduction in the estimate from 1990. However, these estimates are not actually based on real observations, but on unverified model results – in other words, guesswork!

What do scientists report who actually specialize in sea level? According to these specialists there is no way to predict, scientifically, any sea level rise in the 21st Century. The International Union for Quaternary Research (INQUA) is a 75-year-old scientific organization dedicated to researching global environments and climatic changes over the last two million years. INQUA has harshly criticized the IPCC for its handling of sea level forecasts: ignoring the scientists who produce most of the data and observations related to sea level and relying instead on unproven model results. Nils Axel Morner, who until recently was the president of INQUA's Sea Level Commission, states that sea level shows no trend at all over the past three hundred years, and satellite telemetry shows virtually no change in the last decade. Therefore, the IPCC models are totally without scientific objectivity or relevance. According to Morner, there is no fear of any massive future flooding as claimed in most global warming scenarios.

A constant drumbeat of alarmism is maintained in the media, and once again, as an example we can turn to the National Geographic Magazine in the November, 2007 issue (The Acid Threat, p. 113). Having attempted to convince us that we will drown in a new Noah's flood, this article suggest that by the end of the next century the oceans will be so acidic they will be devoid of life. The IPCC argue that only a trivial amount of CO<sub>2</sub> can be dissolved in the oceans, but, on the other hand, maintain this is enough to cause a catastrophe by dissolving all the calcium carbonate in the sea! The IPCC hypothesis requires very long residence times for CO<sub>2</sub> in the atmosphere of 50-200 years, although there are numerous publications of isotopic analyses that indicate an average residence time of only 5-6 years (Segalstad, 2009).

The National Geographic article is based on pseudo-science lacking any proper comprehension of physicochemical or



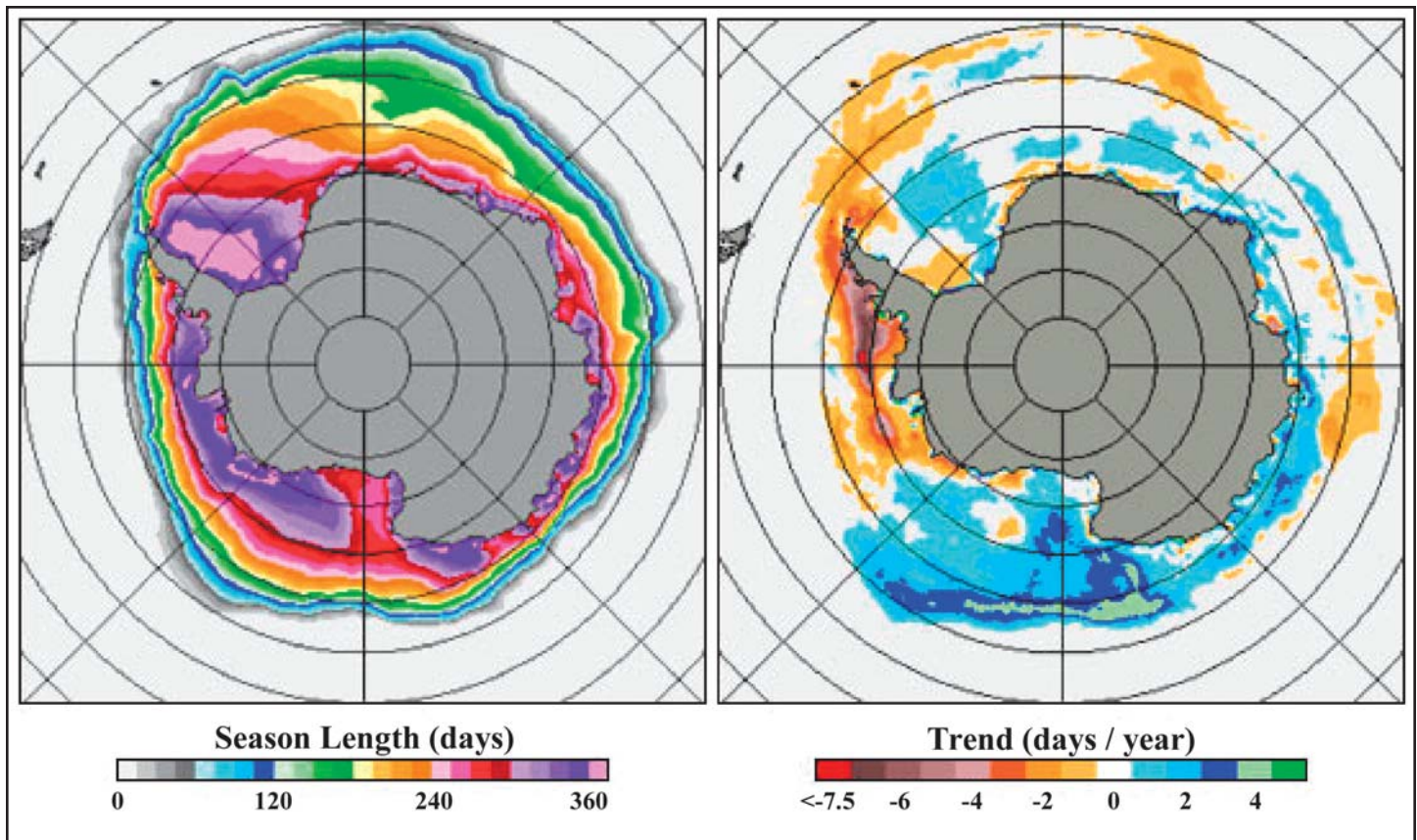


Figure 6.3. Figures documenting increasing sea ice around Antarctica after Parkinson (2002). The left-hand figure illustrates the length of the sea ice season for a period of 21 years (1979-1999). Purple areas indicate annual cover, while light blue are limits of winter ice. The right-hand panel indicates trends where ice days are increasing (blues) and locations where they are decreasing. Parkinson points out that this is inconsistent with global warming theory.

biochemical nature of the oceans. In a very crude experiment, ocean water was acidified by adding carbon dioxide until tiny, calcareous shells of dead copepods became corroded. This was then presented as evidence that the oceans would be totally acidified if no steps were taken to curb the emission of  $\text{CO}_2$ . The fact that this was totally without relevance to the real world's oceans, even as illustrated in this particular issue of National Geographic, was ignored. Warming oceans give up  $\text{CO}_2$  as it becomes less soluble, not the opposite as implied by the "Acid Threat" article. Even when the errors within the article were identified in detail, there was no response from National Geographic, nor any corrective acknowledgement. This is a classic form of censorship exerted by media generally, in which only alarmist material is presented and those of us who retain our critical faculties are ignored.

On page 109 of the November 2007 article is an absolutely superb photograph of a living pteropod. This very tiny planktonic organism appears with its calcareous shell completely surrounded by ectoplasm, the living tissue of the organism. It is within the ectoplasm that the pteropod secretes its supportive shell, not in contact with the sea water. In

the biochemistry of these organisms, the fixing of carbonate ions comes from absorption of carbonic acid. The article also illustrates the incredible biological richness of a drop of sea water, representing only a tiny fraction of the zooplankton and phytoplankton in ocean waters. The illustrations demonstrate the great abundance of cyanobacteria that, at the base of the food chain, fix carbon dioxide by photosynthesis, converting it to oxygen and sugars required to construct and nourish the organism. Even more astonishing, in the light of the "Acid Threat Article," are satellite images of extensive coccolithophore blooms off the coast of Ireland (Figure 6.4). Here we have another example of the tremendous capacity of the live ocean to fix carbon dioxide and deliver the calcium carbonate to ocean sediments. Coccolithophore blooms are not rare. They are widespread in the world's oceans and now, because of satellite imagery, we have evidence of their extent and capacity to fix  $\text{CO}_2$ . Blooms in the North Atlantic are recorded covering areas of 200,000 square miles, and this is only one of a rich variety of planktonic microorganisms which have the capacity for photosynthesis and incorporation of carbon dioxide, often in the form of carbonic acid, to construct their internal carbonate structure. A visual

assessment of world photosynthesis by phytoplankton is illustrated in Figure 6.5 showing chlorophyll concentration in the world's oceans.

The approach of the IPCC is to consider the oceans as if they were dealing with a beaker of lifeless brine lacking any biological or sedimentological content. The live oceans have an almost infinite buffering capacity as a result of biological and sedimentological processes. We can show that all of the calcium carbonate, as calcite or aragonite, deposited in the oceans is mediated by organic activity with an immense capacity to buffer atmospheric  $\text{CO}_2$ . There are other extensive oceanic buffers resulting from sedimentological diagenesis which will result in the stabilization of oceanic pH. For example, anorthite feldspar is typically reduced to kaolinite, releasing aqueous calcium ions available for absorption with  $\text{CO}_2$  into exoskeletons of mollusks and crustaceans of the ocean shorefaces. In clay rich waters,  $\text{CO}_2$  is absorbed releasing silica which may result in chert diagenesis but also provides silica for the endoskeletal structure of diatoms and silicoflagellates. The former are very abundant planktonic organisms forming extensive deposits in some deep marine environments. They



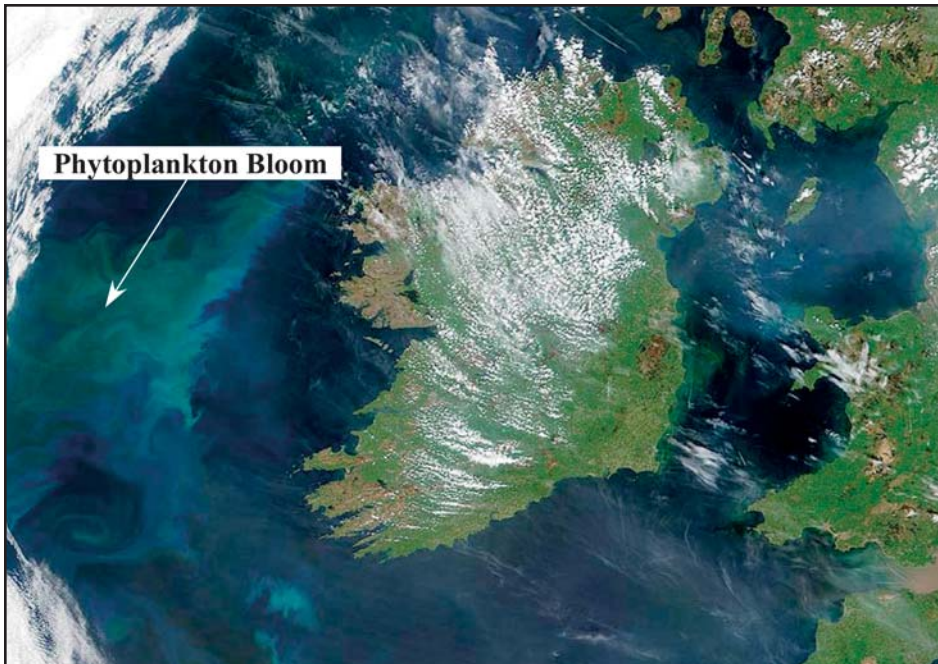


Figure 6.4. A major phytoplankton bloom off the west coast of Ireland covering thousands of square kilometers. It is probable that this bloom is caused by the coccolithophore, *Emiliani huxleyi*, one of the most prolific forms in the modern oceans. Conservative estimates suggest that coccoliths are one of the largest calcite producers in modern oceans. Very conservative estimates suggest that they contribute calcium carbonate in excess of 1.5 million tons per annum. In light of the chlorophyll distribution in the world's oceans (Figure 6.5) the estimate seems very low. However, it provides another indication of the capacity of the world's oceans to buffer  $\text{CO}_2$ .

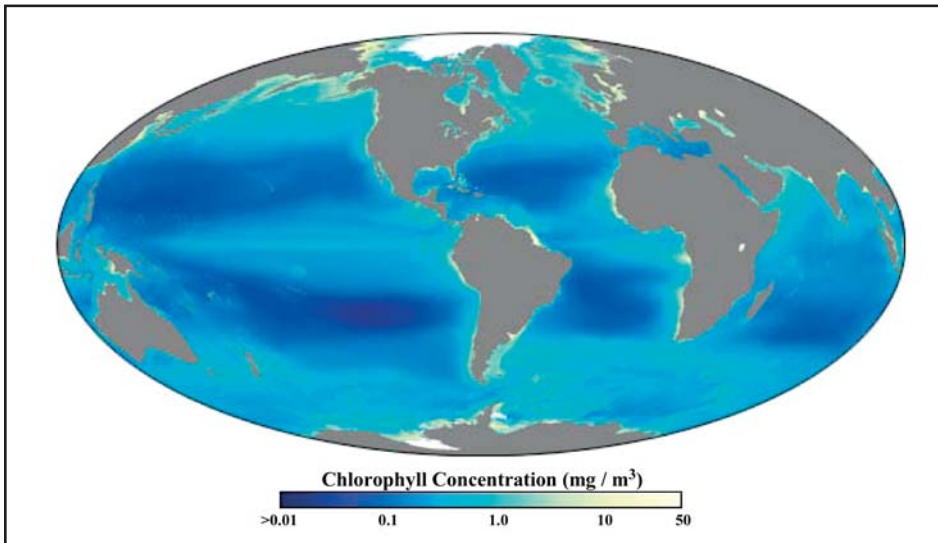


Figure 6.5. Contrary to the "Acid Threat" promoted in *National Geographic*, here is an actual observed measurement of the life in our oceans. This is an image from a satellite sensor indicating the distribution of chlorophyll in the world's oceans. This is a measure of the distribution of phytoplankton, which use chlorophyll in the same manner as terrestrial land plants. At least half the Earth's source of oxygen is generated by phytoplankton in the oceans, and not, as one might expect, the equatorial rain forests. Chlorophyll is shown in milligrams / cubic meter with the greatest concentrations in yellow while the deep blue indicates where nutrients are too scarce to promote phytoplankton growth, in contrast to the cold  $\text{CO}_2$ -rich polar oceans.

absorb  $\text{CO}_2$  during photosynthesis and contribute to the very large buffering capacity of the oceans. Since the oceans have the capacity to absorb approximately 50 times the amount of  $\text{CO}_2$  contained in the atmosphere, not including the immense contribution of the living biological

communities, it is apparent that the oceans by controlling the amount of atmospheric  $\text{CO}_2$  play a vital part in maintaining stable conditions suitable for organic life on earth. It is well known that atmospheric  $\text{CO}_2$  has been at much higher levels in the past. During the Palaeogene, values up to five times

current atmospheric levels have been reported (1,885 parts per million – Pagani, 2005) without injury to ocean life. According to the ocean acidification theory, life could never have evolved on earth! That this is nonsense is obvious, but the constant unqualified repetition in the media of unsubstantiated claims of disaster raises unwarranted concern among the general public. This is particularly so when it occurs in respected mainstream media outlets.

## REFERENCES

Appenzeller, Tim. 2007. *The Big Thaw, Ice on the Run, Seas on the Rise*. *National Geographic*, June 2007.

Doran, P.T., et al. 2002. Antarctic climate cooling and terrestrial ecosystem response. *Nature*, advance online publication.

Gore, Al. 2006. *An Inconvenient Truth*. Movie.

Hanna, E. and Cappelin, J. 2003. Recent cooling in coastal Southern Greenland and relation with the North Atlantic oscillation. *Geophysical Research Letters*, v. 30, 32-1 to 32-3.

Holland, Jennifer S. 2007. *The Acid Threat*. *National Geographic Magazine*, November, 2007, Photography by David Liitschwager.

Holloway, G. and Sou, T. 2002. Has Arctic sea ice rapidly thinned? *Journal of Climate*, v. 15, p. 1691-1701.

Intergovernmental Panel on Climate Change. 1990. *Climate Change 1990: The IPCC Scientific Assessment*. Cambridge University Press, Cambridge.

Intergovernmental Panel on Climate Change. 2001. *Climate Change 2001: The Physical Science Basis*. Cambridge University Press, Cambridge.

Intergovernmental Panel on Climate Change. 2007. *Climate Change: The Physical Science Basis. Summary for Policymakers, Fourth Assessment Report*. Geneva, Switzerland.

Jones, P. D. 1995. Recent variations in mean temperature and the diurnal temperature range in the Antarctic. *Geophysical Research Letters*, v. 20 p. 1345-48.

Krabill, W., et al. 1994. Greenland Ice Sheet Thickness Changes Measured by Laser Altimetry. *Geophysical Research Letters*, v. 22, p. 2341-2344.

Krabill, W., et al. 2000. Greenland Ice Sheet: High elevation balance and peripheral thinning. *Science* v. 289, p. 428-430.

Moncton, C.W. 2007. *35 Inconvenient Truths, The Errors in Al Gore's Movie*. Science and Public Policy Institute. [www.scienceandpublicpolicy.org](http://www.scienceandpublicpolicy.org).



Morner, Nils Axel. 2004. *Estimating Future Sea Level Changes from Past Records*. *Global and Planetary Change*, v. 40, issues 1-2, January, p. 49-54 *New York Times*, December 8, 2002

Polykov, I.V., et al. 2003. *Trends and variations in Arctic climate systems*. *EOS. Transactions of American Geophysical Union*, v. 83 p. 547-48.

Polykov, I.V. and Johnson, M.A. 2000. *Arctic decadal and interdecadal variability*. *Geophysical Research Letters*, v. 27, p. 4097-4100.

Rothrock, D. A., Yu, Y., and Maykut, G. A. 1999. *Thinning of the Arctic sea ice cover*. *Geophysical Research Letters*, v. 26, p. 3469-72.

Segalstad, Tom. 2009. *Carbon Isotope Mass Balance vs. Oceanic CO<sub>2</sub>*. *International Conference on Climate Change*, New York. [www.hearstland.org/events/NewYork09/proceedings.html](http://www.hearstland.org/events/NewYork09/proceedings.html).

Sansom, J. 1989. *Antarctic surface temperature time series*. *Journal of Climate*, v. 2, p. 1164-72.

Thompson, L. G. 2002. *Kilimanjaro ice core records: evidence of Holocene climate change in tropical Africa*. *Science* 298, p. 589-93.

Tkachuk, R. D. 1983. *The Little Ice Age*. *Geoscience Research Institute*, v. 10, issue 2, p. 56-65 or [www.grisda.org/origins/10051.html](http://www.grisda.org/origins/10051.html).

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# CLIMATE CHANGE VII:

## The Spin Cycle

by Dr. A. Neil Hutton

It was not possible to correct the totality of misinformation on Climate Change in one article so – in reality – this is a continuation of “Fearmongering” in which I endeavor to cover the most outstanding issues. The Spin Cycle I refer to is not related to laundry but to the wildly exaggerated claims that global warming is responsible for an increase in cyclonic storms – that is to say, hurricanes, tornadoes, typhoons, and other tropical cyclones as well as other extreme weather events.

Here are the facts: in none of the IPCC assessments was it ever claimed that global warming would result in the development of more violent cyclonic storms. On the contrary, the reports indicated that no global warming signal could be detected in the hurricane record. Dr. Christopher Landsea, a contributing author for IPCC, and an expert on cyclonic activity has stated clearly that, “If global warming is influencing hurricane activity, than we should be seeing a global change in the number and strength of the storms. Yet, there is no evidence of a global increase in the strength and frequency of hurricanes, typhoons, and tropical cyclones over the past several years.” In Figure 7.1, the measured wind strength for hurricanes is shown from 1940-2000; in the Atlantic Basin, the trend is clearly downward.

Nevertheless, leading members in IPCC, principally Kevin Trenberth, (head of the Climate Analysis section at the National Climate Research Center and lead author of the 2007 IPCC report) could not resist the opportunity to use the 2004 hurricane season to engender the dangers of global warming, whether there was any evidence or not. In a press conference, which Landsea had attempted to prevent, Trenberth argued that, “Human activities are changing the composition of the atmosphere and global warming is happening as a result. Global warming is manifested in many ways, some unexpected... (especially for Dr Landsea). The environment in which hurricanes form is changing. The result was a hurricane off the coast of Brazil; the first and only hurricane in that region (a highly improbable assumption which could be readily refuted by examination of Portuguese navigators’ logs in the region). Several factors go into forming hurricanes and where they track. But the evidence, (none was ever cited because there are no studies supporting this

statement) strongly suggests more intense storms and risk of greater flooding events, so that the North Atlantic hurricane season of 2004 may be a harbinger of the future.” (E-mail: Landsea to Trenberth, from Solomon, 2008, p. 38)

The press went wild with this story and it echoed round the world. Trenberth was looking good after Katrina in 2005 but in subsequent seasons hurricane frequency and violence have continued to decline (Figure 7.2). Landsea was sufficiently incensed that he wrote to IPCC officials asking, “Where is the science, the refereed publications that substantiate these pronouncements? What studies are being alluded to that have shown a connection between observed warming trends on the Earth and long term trends in tropical cyclone activity?” The IPCC officials ignored Landsea’s questions and even

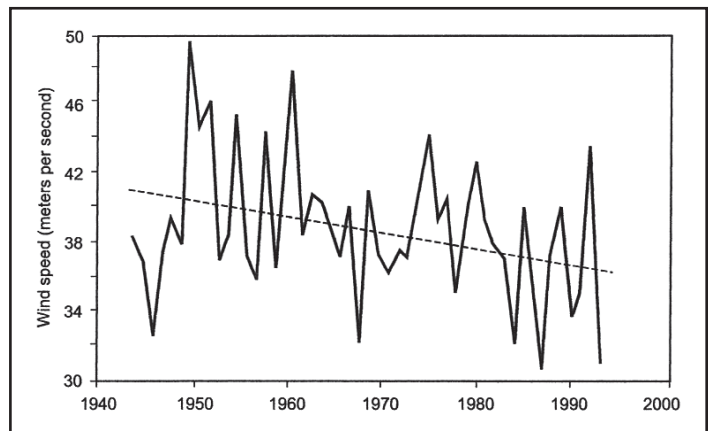


Figure 7.1. Mean Annual Wind Speed in Atlantic Hurricanes. Contrary to the alarmist claims, the maximum wind velocity for hurricanes between 1940-1993 has decreased by five km/hour (approximately 12%). The dotted line shows the best fit linear trend (Source: C.W. Landsea, et al. 1996).

defended Trenberth. As a result, Landsea resigned as a contributing author to the IPCC 2007 Fourth Assessment. Here is a prime example of the political nature of IPCC and their lack of scientific integrity. (<http://chge.med.harvard.edu/media/releases/hurricanepress.html>)

Hurricane Katrina was too good an opportunity to miss, and so, Kerry Emmanuel of MIT argued that global warming is

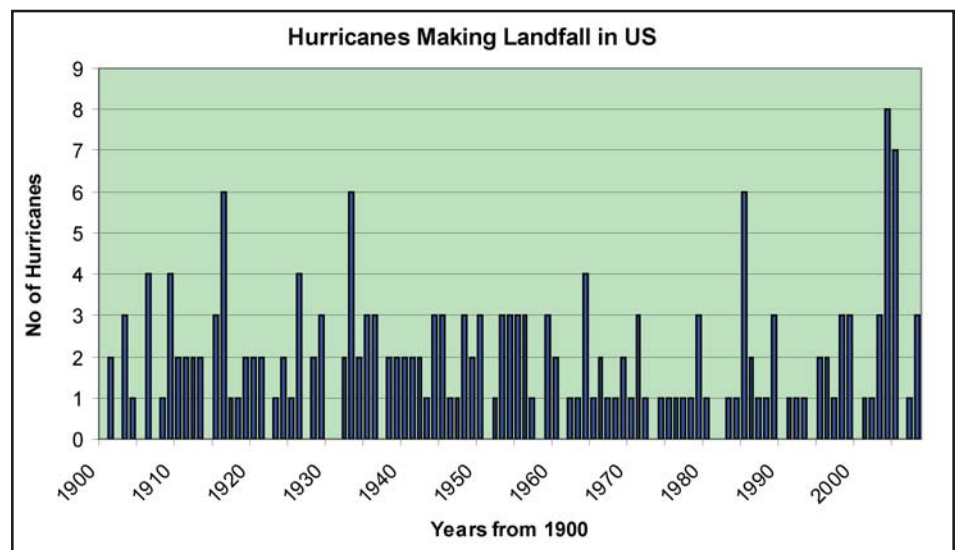


Figure 7.2. The diagram presents the annual number of hurricanes making landfall in the United States from 1900-2008. It is clear that hurricane activity was much higher prior to the 1950s than it has been subsequently. This is a pattern that also appears in measures of storminess, hail, and thunderstorms and is exactly the opposite of what has been claimed by the global warming activists. Furthermore, it is apparent that storms are largely a function of the periodicity of major oceanic oscillations, not changes in atmospheric temperature.



producing more powerful and more destructive hurricanes. The press had another field day. In the meantime Landsea (2005) published evidence that hurricane activity demonstrates natural swings from highs to lows over periodicities of 25 to 40 years. The evidence is records which extend back for 150 years, beyond the decades where global warming can be implicated. Much has been made of rising sea surface temperature as a causative factor but this was thoroughly debunked by Klotzbach (2006) who concluded that sea surface temperature change correlated only marginally with hurricane formation in the Atlantic Basin.

The most telling evidence against rising sea surface temperature as a cause for increasing frequency and intensity of hurricanes, comes from records of the British Navy, which because of commercial interests in the Caribbean, kept careful records of the storms. These records indicate that during the Little Ice Age the region had nearly three times as many major hurricanes than in the warming decades from 1950 to 1998. Contrary to the warming theory, it is contrasts in temperature and pressure which produce the most violent storms. The bigger the temperature differences between the equator and the poles, the more power is provided to the winds, waves, currents, and to the cyclones. As indicated by Figure 7.1, warming is actually reducing the wind speed of hurricanes.

The story on tornadoes is similar. It is claimed that they are increasing in frequency and strength, but the reality is quite different. Certainly, many more tornadoes are observed because of the introduction of Doppler radar, which has excellent ability to capture the signal of a tornado (Figure 7.3). Radar is the backbone of early warning systems that have been instrumental in

reducing deaths – the expectation would be that deaths should have increased as a result of population increase and increased urbanization in tornado-prone areas.

Although the recorded tornadoes have increased significantly, it is very clear in Figure 7.4 that, as far as the major category storms, (F3, F4, and F5 on the Fujita scale – a scale based on the damage caused to manmade structures), there is no evidence of an increase in major tornadoes. As is the case with hurricanes, the assumption that warming will cause more tornadoes is false. The midwest United States is tornado-prone because there is essentially no topographic separation between the tropical Gulf of Mexico and the cold of the Arctic. If warming resulted in tornadoes, the summer months June, July, and August would be the tornado season. This is not the case as the season peaks in May when the jet stream shifts north for the summer. Interaction of strong easterly flow of cool air from the jet stream interacts with the warmed air in thunderstorms. The resulting rotation triggers the twisters. Like hurricanes, larger temperature contrasts cause more violent storms. Therefore, warming should cause the jet stream to remain in northern latitudes longer, reducing the number of violent tornadoes.

Finally on cyclonic storms, what about Asian typhoons? Certainly the perception has been created that typhoons will increase with global warming but significant recent studies show otherwise. Wang et al. (2008) report that of 1,845 typhoons occurring in the northwestern Pacific region between 1951 and 2004 there has been a steady decline of approximately 1 typhoon every decade, but the greatest decline has occurred in the last ten years! The largest drop is recorded in the super typhoons (equivalent to categories F4 or F5 hurricanes).

Wang and his colleagues demonstrate that there is a link between typhoons and sea surface temperature (SST), but not as a result of global warming. Rather, fluctuations in SST caused by the Pacific Decadal Oscillation (PDO) and the El Nino Southern Oscillation (ENSO) affect the number of typhoons generated. When ENSO is in the cold phase with La Nina years, there will be more typhoons; when ENSO is in the warm phase in El Nino years there are fewer typhoons. Here note that, as we found with hurricanes, the cold phase induces more frequent and more violent tropical storms, completely contrary to global warming theory. Chan (2000) has also shown that tropical cyclone activities – in frequency, intensity, and track – are unrelated to global warming. Furthermore with Wang, he attributes the patterns of typhoon activity to decadal and multi-decadal oscillations and variations in ocean temperature. In Figure 7.5, the number of tropical cyclones making landfall in Japan is shown with no trend linked to warming, but with very strong activity in 2004, paralleling the very active hurricane season in the Atlantic Basin (see Figure 7.2, page 35).

According to the IPCC in 1996, “Most climate models produce more rainfall over South Asia in a warmer climate with increased CO<sub>2</sub>.” In its 2001 report, the IPCC said, “It is likely that the warming associated with increasing greenhouse gas concentrations will cause an increase in Asian summer monsoon variability and changes in monsoon strength. Again we are dealing with models and not reality. Kripalani et al. (2003) studied the variability of India’s monsoons as the earth has warmed since the Little Ice Age and found that the IPCC models were wrong. As in many other climate systems there is a distinct oscillation, over a period of 3-10 years, during which rainfall fluctuates

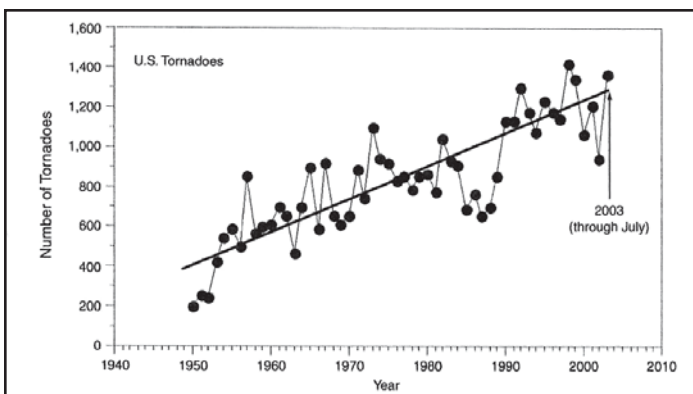


Figure 7.3. The diagram demonstrates the annual increase in observed tornadoes in the continental United States. There is a very clear increase from 1950-2000 but the increase is actually related to improved ability to identify a tornado’s signature with Doppler radar. The early warning provided has saved many lives. Figure 7.4 shows that severe tornadoes have actually decreased.

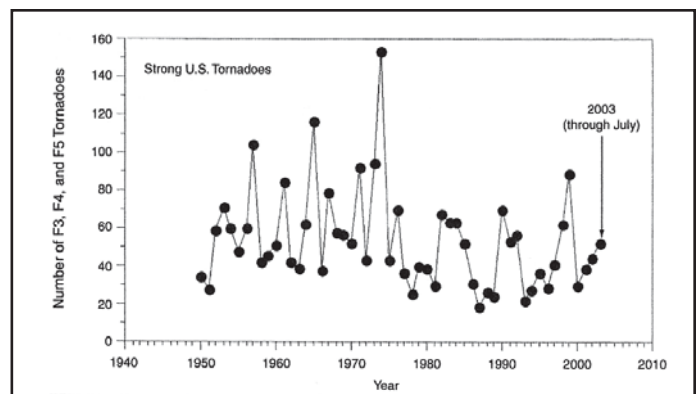


Figure 7.4. The frequency of Category 3, 4, and 5 tornadoes in the continental United States. These are the most severe storms and the trend shows a decrease in frequency and strength of major tornadoes. They account for less than 5% of the tornadoes in Figure 7.3.



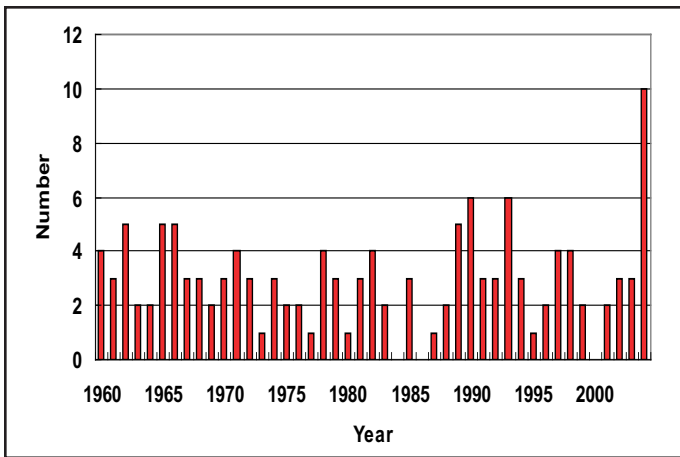


Figure 7.5. The annual frequency of tropical cyclones making landfall in Japan. There is no clear trend associated with warming. In fact, the most active typhoon seasons are associated with the La Nina cold phase of the ENSO cycle. Note the very active cycle in 2004, which corresponds with a similar period in the Atlantic basin as shown in Figure 7.2 (from Chan, 2000).

between higher than average and lower than average conditions. There is no evidence that this is related to rising temperatures. Moreover during the 1990s – which IPCC claim to be the warmest decade of the millennium – Indian monsoon variability declined sharply. Wang et al. in their 2008 study indicated that the frequency of typhoons is closely linked to the summer monsoons in East Asia, and not related to global warming.

Notwithstanding the well documented errors in the Gore documentary, An Inconvenient Truth, it continues to be aired by CBC. Not only that, it is introduced by a scientifically unwarranted introduction on the website as follows:

“Humanity is sitting on a ticking time bomb. If the vast majority of the world’s scientists are right, we have just ten years to avert a major catastrophe that could send the entire planet into a tailspin of epic destruction involving extreme weather, floods, droughts, epidemic and killer heat waves beyond anything we have ever experienced.”

This statement is nothing more than climate evangelism threatening climate Armageddon completely unsupported by any scientific study. It is doubtful if any scientist, even those who support human-caused climate change, would agree with this apocalyptic statement. As we will see, there is in fact no published evidence to support such claims. For a start, although there has been little change in the increase in CO<sub>2</sub> entering the atmosphere, there has been no warming during the 21st century. What does the peer-reviewed literature really say? The journal,

storminess. One might argue that the media is a greater problem than global warming. As discussed above there has been no increase in hurricanes, tornadoes, typhoons, or thunderstorms or other severe weather? Changnon and Changnon (2001), by checking “thunder days” from 300 US weather stations, demonstrated that from 1896 to 1955 thunder days increased but have shown a moderate decrease since that date. In similar fashion these authors found an increase in hailstorms from 1916 until 1955 after which there was a general decline in hail activity. Similarly in Canada, Khandekar, (2002) reports that there has been no increase in extreme weather events (heat waves, floods, winter blizzards, thunderstorms, hail, or tornadoes) anywhere in Canada. Extreme weather events have been on the decline for the last 40 years. Khandekar noted that the hottest summers were actually during the dust bowl years of the 1920s and 1930s, not in the 1990s. In other words, contrary to the hype, warming has actually produced fewer extreme weather events.

Many claims are made that floods and droughts will be more extreme, sometimes simultaneously! This no doubt derives from the rather

“Natural Hazards” published a special issue on extreme weather events and global warming. None of the published articles indicated increased storminess due to increases in temperature or CO<sub>2</sub>.

Balling and Cerveny (2003), writing in the Natural Hazards special issue, observed that the public is three times more likely to see an article on severe weather today than only thirty years ago: this despite the lack of any increase in

extraordinary statement of IPCC, Summary for Policymakers, Climate Change, 1995, “Warmer temperature will lead to prospects for more severe droughts and/ or floods in some places and less severe droughts and/ or floods in other places.” In effect, any anomalous occurrence in moisture, positive or negative, can be attributed to global warming. Warming in theory should increase rainfall since it will increase the water vapour taken up by the atmosphere. This is supported by the fact that rainfall has increased gradually since the 1980s (Figure 7.6), but not to the extent to produce any hazards. On the contrary, it has clearly been a benefit in improved hydrological conditions on agricultural lands. There have been significant droughts in Africa and the southwestern United States but here the evidence suggests that the control of precipitation is more directly attributable to the major oceanic cycles such as the Pacific Decadal Oscillation (PDO), and El Nino Southern Oscillation (ENSO). Fouchereau (2003) has shown that African droughts are more sensitive to the ENSO cycles rather than temperature variation. In the years from 1979 to 1988, the four driest years coincided with peaks of the ENSO cycle.

Similarly when we consider available data for the Prairie regions of North America, droughts of varying intensity and duration have occurred for many centuries long before instrument records were available. Tree ring data suggest that some of the worst droughts occurred during the thirteenth and sixteenth centuries. Droughts have occurred throughout the 20th Century with some of the severest droughts occurring during the 1920s and 1930s, the so-called dustbowl years. Recent droughts of the 1980s and 1990s are comparable to those of the dust bowl years. According to Khandekar largescale atmospheric circulation patterns over the central equatorial Pacific as well as

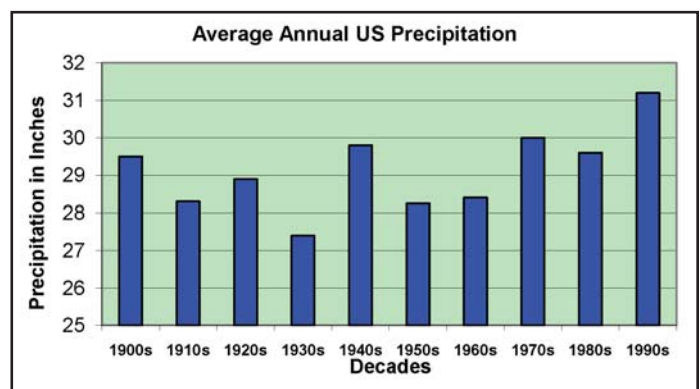


Figure 7.6. Average US average rainfall per decade. There has been a gradual increase of about 10% in precipitation in the 20th century but there is no clear correlation between temperature and precipitation. The increase in precipitation in latter decades results from an increase in light rains not storm events.



over the central and eastern north Pacific, appear to be the main drought-driving forces. The cold La Nina phase of the ENSO cycle over the equatorial Pacific, and its continued presence, appears to be the most important precursor for drought occurrence. The warm El Nino phase of the ENSO cycle is usually associated with surplus precipitation during the grain-growing season. Khandekar concludes that there does not appear to be any linkage between recent droughts and warming of the Earth's atmosphere.

With droughts come fire and, of course, the usual media claims of a fiery apocalypse driven by global warming (Herbert, 2002 New York Times). By now it should be no surprise that the statistics show otherwise, at least for the United States. Figure 7.7, shows that the average acreage burned in the United States has decreased and essentially remained stable for the last forty years. No doubt more sophisticated fire

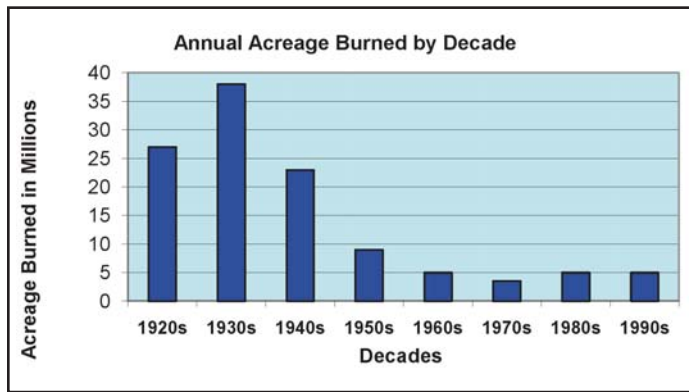


Figure 7.7. The average acreage burned annually in the United States by decade. Contrary to the press, there has been a distinct decline with stability through the last four decades.

suppression techniques have played a role. On the other hand, it is argued that, fire suppression has been counterproductive, resulting in denser undergrowth and deadfall providing fuel for uncontrollable wild fires. In fact the climate-influencing droughts and rainfall are more intimately associated with major oceanic cycles such as PDO, ENSO, and the cyclonic oscillations in the Atlantic Basin. The role of warming in itself can not be detected in regional climate variations.

We find no basis for the claims of an increase in extreme weather events, but what of claims, such as those of CBC and others, that warming will result in species extinction, epidemics, and killer heat waves. Suffice to say that the basis for these claims is also based on poor research, lack of historical perspective, and poor analysis and statistical treatment of results. It would be beyond the scope of this article to provide a full treatment of the issues but excellent coverage is provided in the following texts:

Meltdown, The Predictable Distortion of GLOBAL WARMING by Scientists, Politicians, and the Media. Patrick J. Michaels, 2004, Cato Institute, Washington, DC, p. 73-109, and 179-194.

Unstoppable Global Warming, S. Fred Singer and Denis Avery, 2007, revised 2008, Rowman and Littlefield Publishers, Chapter 9, p. 163-185 and Chapter 12, p. 213-219.

Both of these books are highly recommended for anyone who wishes to filter the hype out of Global Warming, especially that by the Media.

There is no doubt that the IPCC have very skillfully manipulated the platform provided by their UN mandate, with the very able assistance of the media. As each major IPCC Conference rolls around the press releases

become more extreme: The Associated Press, March 12, 2009, "Hundreds of Scientists warned today that global warming is accelerating beyond the worst predictions and threatening to trigger "irreversible" climate shifts on the planet." There is not one single piece of evidence to justify such claims. None of

the IPCC climate scenarios have ever matched the climate data even at the low end. There has been no warming this century; the climate feedbacks assumed in Global Climate Models are incorrect; and satellite microwave measurements of the troposphere have never observed the warming predicted by the IPCC Climate Models. Finally the Sun is in a quiescent mode with 620 sunspot-free days versus an average of 336 days in the recent 20th Century. A minimum of this scale has not been observed since the 19th Century. Indeed, we may experience an "irreversible" climate shift but entirely in the opposite direction from the bold statements of the hundreds of scientists in Copenhagen.

#### REFERENCES

Balling, R. C., Jr. and Cerveny R. S. 2003. *Compilation and Discussion of Trends in Severe Storms in the United States: Popular Perception or Climate Reality?* *Natural Hazards* v. 29, no. 2, p. 103-112.

Chan, J. C. L. 2000. *Frequency of Typhoon Landfall in Guangdong Province of China during the period 1470-1931.* *International Journal of Climatology*, v. 20 no. 2, p. 183-190.

Changnon, S. and Changnon, D. 2001. *Long-Term Fluctuations in Thunderstorm Activity in the United States.* *Climatic Change*, v. 50, p. 489-583.

Changnon, S. and Changnon D. 2000. *Long-Term Fluctuations in Hail Incidences in the United States.* *Journal of Climate*, v. 13, p. 658-664.

Emmanuel, K. 2005. *Increasing Destructiveness of Tropical Cyclones over the past 30 Years.* *Nature*, v. 436, p. 686-688.

Fauchereau, N., et al. 2003. *Rainfall Variability and Changes in Southern Africa during the 20th Century in the Global Warming Context.* *Natural Hazards* v. 29, p. 139-154.

Herbert, R. 2002. *New York Times*, June 24th issue. Khandekar, M. L. 2004. *Canadian Prairie Drought, a Climatological Assessment.* *Alberta Environment*, <http://www.gov.ab.ca/envl>.

Khandekar, M. L. 2002. *Comment on (World Meteorological Organization) Statement on Extreme Weather Events.* *EOS Transactions, American Geophysical Union*, v. 84, p. 428.

Klotsbach, P. J. 2006. *Trends in global cyclone activity over the past twenty years (1986-2005).* *Geophysical Research Letters*, v. 33, L010805, doi:10.1029/2006GL025757.

Kripilani, R.H., et al. *Indian Monsoon Variability in a Global Warming Scenario.* *Natural Hazards* v. 29, p. 189-206.

Landsea, C. 2005. *Hurricanes and Global Warming.* *Nature*, 438, December.

Landsea, C., et al. 1996. *Downward Trends in the Frequency of Intense Atlantic Hurricanes in the Last Five Decades.* *Geographical Research Letters* v. 23, no. 13, p. 1697-1700.

Michaels, Patrick J. 2004. *The Predictable Distortion of GLOBAL WARMING by Scientists, Politicians, and the Media.* *Cato Institute, Washington, DC.*

Singer, S. Fred, and Avery, Dennis T. 2007. *Unstoppable Global Warming.* Rowman and Littlefield Publishers, Lanham, Maryland, revised 2008.

Wang, Y. Li, C. Ren, F., and Wang X. 2008. *Study on Climatic Characteristics of China-Influencing Typhoons and the Interrelations between them and their Environmental Factor.* *Journal of Tropical Meteorology* v. 14, no. 1 p. 24-27.



# CLIMATE CHANGE VIII:

## Global Circulation Models

by Dr. A. Neil Hutton

Edward Lorenz was a pioneering mathematician meteorologist at MIT. He began to study weather patterns by developing a series of simplified equations that he ran on an early, primitive computer. He had some success in representing weather patterns, but in a classic piece of scientific serendipity he decided to rerun one of his programs and continue it over a longer period. He was amazed to find that the rerun initially matched the first run but then diverged completely (Figure 8.1). Lorenz at first believed the problem was with the computer, but when everything was reexamined, it turned out that the problem was a rounding error. The computer operated to six decimal places but, to facilitate data entry, Lorenz had rounded the data to three decimal places. According to conventional thinking, small initial changes of one / ten thousandth to one / millionth should have commensurate consequences, but as Lorenz eventually deduced, even although the change was tiny, it had profound effects. This phenomenon is known as sensitive dependence on initial conditions or, more popularly, the butterfly effect. The name deriving from Lorenz's 1979 address to the American Association for the Advancement of Science entitled, "Predictability: Does the Flap of a Butterfly's Wings in Brazil set off a Tornado in Texas." Lorenz concluded that since it was impossible to assess initial conditions to the accuracy required, then there was no means to provide weather forecasts for more than a few days. Lorenz suggested it required a grid of one-meter-square sensors throughout the globe, otherwise deterministic forecasts were impossible. Currently – even with satellite observation, radar, infrared, and other coverage – weather forecasts are limited to five days, but commonly decay within 48 hours. Thus, even now, when we predict the weather even 24 hours before it arrives, accuracy is limited. A reasonable conclusion is that, if not possible to forecast the weather a week forward, how can it be possible to forecast climate 100 years forward?

There is an argument presented by climatologists that weather and climate differ. That is to say that weather is an initial value problem ("the butterfly effect") limiting reliable forecasts to 5-10 days. Climate on the other hand is a "boundary value problem"! In climate forecasting, an

examination is made of how changes in the rules by which climate systems operate can change the average weather. There appears to be a non sequitur here, since climate is an iteration through time of weather. We average over time conditions to classify climates into major zones and subzones, such as equatorial, tropical, dry (arid and semi-arid), Mediterranean, maritime temperate (oceanic), and so on. Climate, therefore, is fundamentally a derivation of the weather continuum over time. Furthermore, the only change in the "rules" that has been examined is the addition of CO<sub>2</sub> since the industrial revolution. The first problem in comprehending the rules is that CO<sub>2</sub> represents such a tiny fraction of the atmosphere that it, in itself, can not exert a significant influence. This problem is generally conceded by climatologists. They, therefore appeal to an unproven assumption that the tiny amount of warmth generated by CO<sub>2</sub> molecules will induce more cloud in a positive feedback cycle which the alarmists suggest could result in a runaway greenhouse effect destroying the planet. That this is the

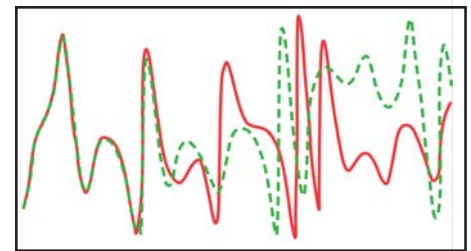


Figure 8.1. The Lorenz Experiment: The Father of Chaos Theory's first experiment indicating sensitivity dependence on initial conditions. The difference in the starting values of the two curves is only 0.000127. Nevertheless, this very small departure results in a very large change in the end result: the butterfly effect (after Stewart, I., 2002, Figure 57, page 128; source: <http://www.imho.com/grae/chaos/chaos.html>).

most arrant nonsense is easily demonstrated by the fact that at the present time CO<sub>2</sub> levels are at their lowest levels in the Earth's history (Figure 8.2). If the alarmist theories were correct life would never have evolved on the planet.

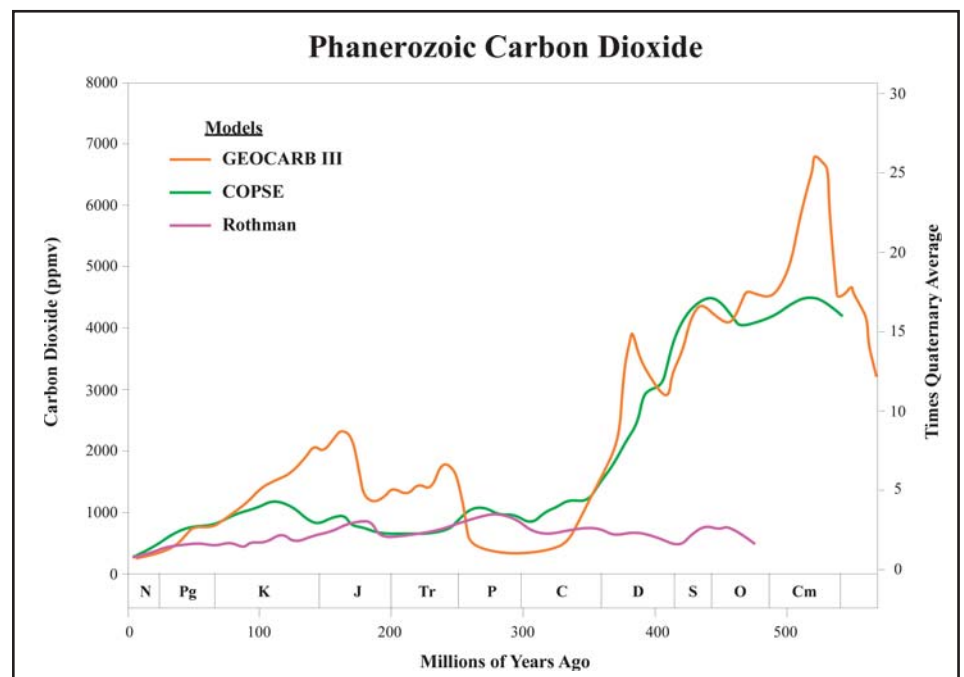


Figure 8.2. Phanerozoic CO<sub>2</sub>: CO<sub>2</sub> concentrations for the last 600 million years, in parts per million on the left axis and as multiples of current concentrations on the right. The past 400,000 years is highly contracted on the left. It is perfectly clear that the current CO<sub>2</sub> concentrations are at the lowest levels in geological history. On this basis, current levels of only 385 ppmv do not present any particular hazard to human existence (after Singer, S.F. 2008, Figure 24, page 24; source: [http://www.heartland.org/custom/semod\\_policybot/pdf/22835.pdf](http://www.heartland.org/custom/semod_policybot/pdf/22835.pdf)).



What then are the climate models attempting to show? Climate models are simply strings of computer code or algorithms which attempt to simulate the behaviour of the atmosphere. If the model does not match reality, they require modification. From a scientific perspective, a climate model is a hypothesis in search of validation by observed data. Normally, in developing atmospheric climate models, it would be a standard procedure to hindcast the model performance against historic climate data. If a good match was attained for historic climate, the reliability of forecasts would be more credible. In fact, this has never been done. This is because climate models depend entirely on CO<sub>2</sub> as their climate change driver. However, according to the orthodox global warming theory, preindustrial levels of CO<sub>2</sub> were monotonously low and constant, as indicated by several ice cores from the Antarctic (Hutton, 2009a, Figures 1-5). This presents a serious problem to the modelers because there is a vast published literature (www.co2science.org) documenting cycles of warming and cooling coeval with the ice core data (Figure 8.3). The incontrovertible conclusion is either the ice core data is wrong, or CO<sub>2</sub> has no role whatsoever in climate variability. We have argued previously that the proxy CO<sub>2</sub> values in ice core data are depleted, and are not representative of contemporaneous atmospheric CO<sub>2</sub> (Hutton, 2009a, p. 40). Here, fundamentally, is the disproof of the entire global warming by CO<sub>2</sub> theory. If the ice core proxy atmospheric CO<sub>2</sub> values were plugged into current climate models it would show continuous cooling from the Little Ice Age (1650-1750) to the Holocene, some 10,000 years ago. From a wide range of geological, archaeological, and historical data in literally hundreds of peer-reviewed papers, this is wrong. The climate was cyclical through a series of warm and cold periods (Figure 8.4) with many instances of temperature exceeding our current maximum.

How is it that Global Circulation Models (GCM) have become the super stars of climate research and are presented as evidence for the effects of warming even when contradicted by real data observations? The GCM are three-dimensional computer models that attempt to integrate and project into the future all of the major influences of climate. The list is extensive and the problem is so complex and massive that programs can only be run on supercomputers, which means that only wealthy nations can afford to run them. The major centers are Britain's Hadley Centre, NASA, Goddard Institute for Space Studies (GISS), the National Centre for Atmospheric Research (NCAR), and the National Oceanic and Atmospheric Administration's (NOAA) Geophysical Fluid

D y n a m i c s Laboratory. The models attempt to work from first principles using fundamental physical laws, thermodynamics, fluid dynamics, the carbon cycle, the water cycle, and so on. In turn, the first principles are converted to mathematical equations or more empirical algorithms for a vast three dimensional array of grid boxes representing the global surface and atmosphere. The computer generates new values for each grid box as the model steps forward in time by an assigned interval – 0.5-1.0 hour – again and again through the simulated time period. The projected climate change is assessed by re-running the models with different levels of greenhouse gases, aerosols, or other factors assumed to be involved in climate change. The complexity of such an undertaking is certainly overwhelming. On the other hand, what is astonishing is the data (listed below) fundamental to climate analysis that is not included. What this is analogous to is having a gigantic toy in which fundamental parts, like the batteries at Christmas, are not included.

In fine print on the side of the GCM toy box we find:

- The Sun spot cycle – Not Included;
- The dimensions and strength of the Heliosphere – Not Included;
- The AP progression Index (a measure of solar wind) – Not Included;
- The strength of cosmic ray flux – Not Included;

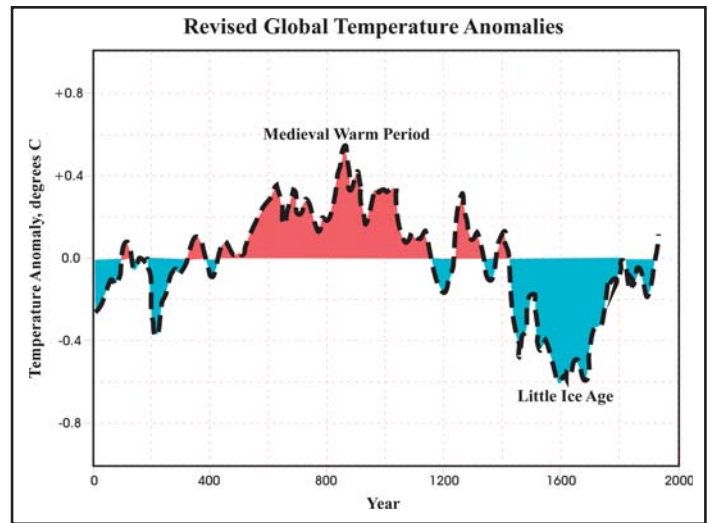


Figure 8.3. Global Temperature Anomalies: This figure is based on the Loehle and McCulloch study of eighteen 2,000-year-long proxy studies from around the world, excluding tree ring studies (which have inherent problems). The evidence for these climatic cycles is of very high quality with the Medieval Warm Period recording higher average temperatures than the Modern Warming (after Loehle and McCulloch, 2008, Figure 2, page 97).

Post Pleistocene Climate Cycles		
Name	From	To
Pleistocene Ice Age	110,000	14,700
Rolling	14,700	13,900
Older Dryas	13,900	13,600
Allered	13,600	12,900
Younger Dryas	12,900	11,600
Holocene Warming	11,600	8,300
Egyptian Cooling	8,300	8,000
Holocene Warming	8,000	5,600
Akkadian Cooling	5,600	3,500
Minoan Warming	3,500	3,200
Bronze Age	3,200	2,500 BC
Roman Warm Period	500 BC	535 AD
Dark Ages	535 AD	900
Medieval Warm Period	900	1300
Little Ice Age	1300	1850
Modern Warm Period	1850	present

Figure 8.4. Post-Pleistocene Climate Cycles since the end of the last glaciation. There are 16 climate oscillations, with the warm cycles shown in pink and cold in blue (source: <http://www.co2science.org/articles/V11/N5/CI.php>).

- The experimentally demonstrated and observationally recorded nucleation of low cloud by cosmic rays – Not Included;
- The natural heat flux of the Earth – Not Included;
- The heat flux through the oceans of some 64,000kms of spreading centres and unrecorded subsea volcanoes and fumaroles – Not Included;
- Ability to understand the cause and effect of the major oceanic cycles, such as the North Atlantic Oscillation, the Pacific Decadal Oscillation, or – the most profound of these – the El



Nino Southern Oscillation – Not Included.

Would you be prepared to buy this toy and rely on its forecasts? Unfortunately we already have. But what is the track record of forecasts developed by the GCMs. We have already described forecasts which are contradicted by observed data, such as the predicted increase in Asian Monsoon variability and strength contradicted by Kripilani's (2003) study, (Hutton, 2009d, p. 3), and IPCC models of predicted sea level change not supported by observed satellite data (Hutton, 2009c, p. 5).

The most recent Intergovernmental Panel on Climate Change reports depend almost totally on computer modeling, and the projections are presented as validated science, rather than poorly constrained projections for which the assumptions are obscure and certainly inadequate. A fundamental projection of the Anthropogenic Global Warming Hypothesis is that the addition of CO<sub>2</sub> to the atmosphere will result in an increasing warming with altitude, peaking at roughly 10km at about twice the surface value. The model results are presented in Figure 8.5 as shown in the IPCC report (IPCC-AR4, 2007, p. 675). If the theory is valid, then measured observational data should confirm the model simulation. They do not. Satellite data have never confirmed the projection illustrated in Figure 8.5. In contrast, observed temperature trends from the analysis of radiosonde data show the reverse, a slight cooling trend with altitude (Figure 8.6). If we were dealing with objective scientific analysis, this result would definitively falsify the theory. It has not. The IPCC cling grimly to one single line of evidence, the weak correlation between atmospheric CO<sub>2</sub> and the global average surface temperature and that only since 1850, while the planet was recovering from the depths of the Little Ice Age. The inconvenient cyclical nature of the entirety of Earth's prehistory is ignored.

The situation is similar if we consider the projections for future climate from IPCC models in each of the assessments reports (First Assessment Report, 1990; Second Assessment Report, 1996; and Third Assessment Report, 2001) as shown in Figure 8.7 (page 42) (IPCC, 2007, Historical Overview of Climate Science, p. 98, Figure 1.1). Most observers would conclude that the IPCC projections do not correlate very well with the observed data. It gets worse when future scenarios are added. In Figure 8.8 (page 42), the same data from Figure 8.7 is repeated, but now includes IPCC forecasts out to 2025. These forecasts, now designated as scenarios, are essentially straight line

projections of the earlier observed trend and the projected increase in CO<sub>2</sub>. The computer models used lack any climate variable other than CO<sub>2</sub> so they can accommodate no other trend. The orange trend signifies a theoretical climate variability with no additional greenhouse gases (CO<sub>2</sub>) or aerosols. The observed temperature projection (heavy black) extends to 2005 and shows a flattening curve. The further cooling of about 0.15°C from 2005 to 2009 will cause the extension of observed data to intersect the predicted orange curve. The conclusion is clear: the IPCC scenarios are wrong. Dr. Syun Akafosu of the University of Alaska has made an analysis in which he documents the control of the multi-decadal oscillation on 20th century climate. His projection is illustrated with the current downward cooling trend of observed data (Figure 8.9, page 42). The IPCC scenarios are clearly unsupportable as scientific evidence.

At this point it would be reasonable to consider if forecasts, scenarios, or storylines, as they have been variously termed in IPCC reports, are science. The standard for an acceptable scientific hypothesis, over the last 300 years of scientific enquiry, requires that the hypothesis makes predictions that can be subsequently tested. Hendrik Tennekes has argued, following Edward Lorenz of the "butterfly effect," that meteorology was heading into an unsolvable dilemma since the nature of the atmosphere and the complexity

of the climate system could not be resolved. No matter the refinement of the observation network, or the increase in power of computers, the average useful forecast is still in the range of a few days.

In addition to the sensitivity to initial conditions issue, is the fact that computer modeling is about the incremental linearization of a nonlinear dynamic system – one that is not in global thermodynamic equilibrium either within itself or with its surroundings. The linear modeling negates the reality of unconstrained turbulent flow. In an attempt to overcome these difficulties the approach is to use ensemble forecasting

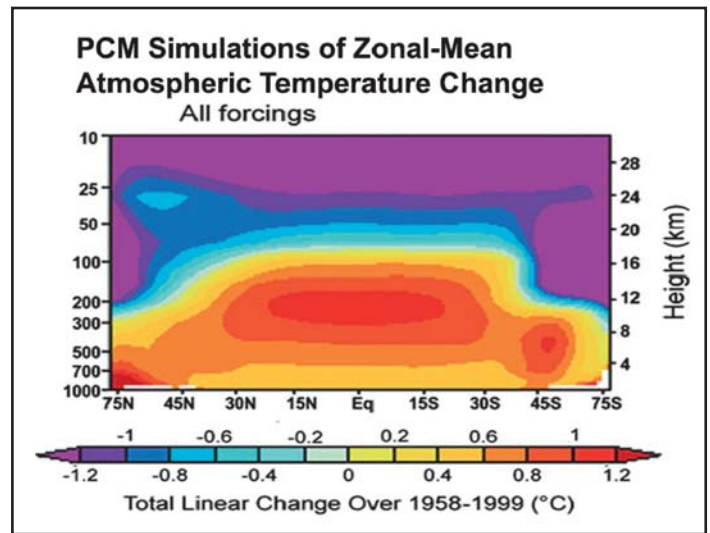


Figure 8.5. Greenhouse-model-predicted temperature trends versus latitude and altitude presented in IPCC-AR4, (2007, p. 675). The figure shows a predicted increased temperature trend in the tropical mid-troposphere of 1.2°C. In thirty years of satellite observations, this trend has never been observed (source: [http://www.heartland.org/custom/semod\\_policybot/pdf/22835.pdf](http://www.heartland.org/custom/semod_policybot/pdf/22835.pdf)).

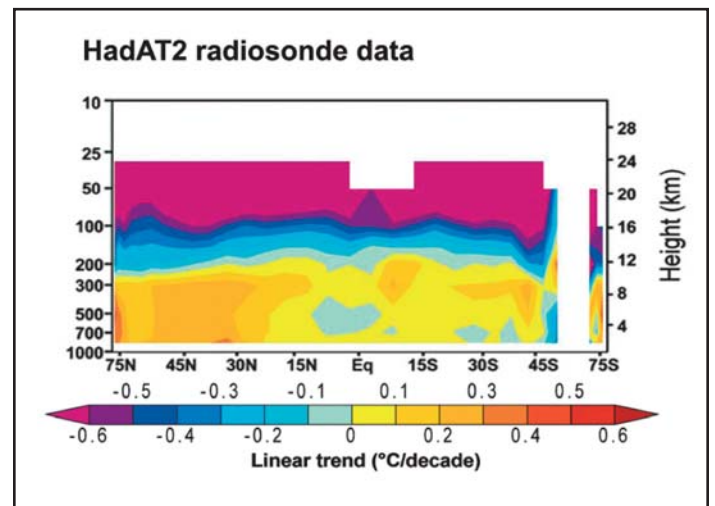


Figure 8.6. Actual data observations from radiosonde balloons versus latitude and altitude. The trends are derived from the Hadley Centre, Climate Research Unit and are an excellent match for similar US analyses. Notice that there is no warming trend in the tropical mid-troposphere but a slight cooling (source: [http://www.heartland.org/custom/semod\\_policybot/pdf/22835.pdf](http://www.heartland.org/custom/semod_policybot/pdf/22835.pdf)).



Figure 8.7. Yearly average global surface temperature observations versus the projections from the First (1990 FAR in blue), Second (1996 SAR in orange), and Third Assessment Reports (2001 TAR in green vertical stripes) as shown in the IPCC-AR4,2007, "Historical Overview of Climate Science," p. 98, Figure 1.1. The best estimates for FAR and SAR are in solid lines, but this estimate was not provided in the TAR. The annual mean observations are provided by the heavy black dots which show little or no relationship to the model projections. The observed data is dominated by cooling from the Pinatubo volcanic eruption in 1992, and the very strong El Nino warming in 1998. The heavy black line is a smoothed version of the decadal variation which shows a poor correspondence with any of the forecasts (source: <http://www.ipcc.ch/pdf/assessmentreport/ar4/wgl/ar4-wgl/chapter1.pdf>).

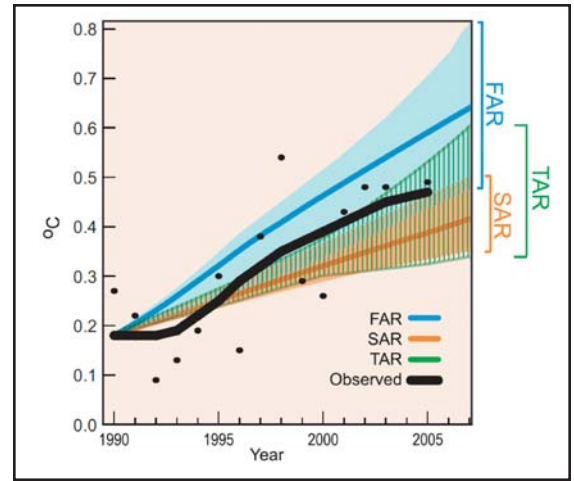
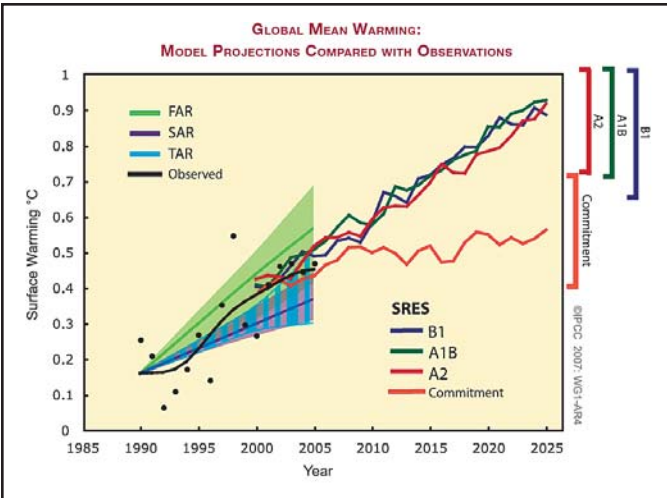


Figure 8.8. Compares the data from Figure 8.7 with the addition of predicted scenarios derived from IPCC-AR4 (Ch. 10, Figure 10.4) to the year 2025. Multi-model mean projections from the report are shown from 2000-2025 with the scenarios B1 in blue, A1B in green, and A2 in red with the range of uncertainty displayed in bars to the right. The orange (commitment) scenario reflects a projection of temperature with no further greenhouse gases or aerosols. The heavy black is the observed temperature, but extends only to 2005, since which time there has been 0.15°C of cooling. This will cause the observed trend to drop and intersect the orange projection assuming no CO<sub>2</sub> or aerosols. This result invalidates the IPCC projections completely, demonstrating that CO<sub>2</sub> is not the primary climate driver (source: <http://rankexploits.com/musings/wp-content/uploads/2008/07/ar4tarsar.gif>).

and multi-model forecasting. The same difficulties exist within the models, and whether any one of the ensemble reflects a representation of the real world can not be established as there is no means to confirm its reliability or accuracy. Karl Popper, one of the 20th Century's leading scientific philosophers, takes issue with this deterministic approach, which he regarded as false, dangerous, and leading to arrogant, undisciplined, and (worst of all) unfalsifiable predictions masquerading as science – a statement which fairly describes the entirety of the IPCC case for global warming.

Popper's philosophy is that a scientific proposition or hypothesis must be "falsifiable." This restraint requires that every scientific claim include, at least implicitly, a clear notion of what evidence would be required to prove that the proposition is untrue. This requires some scientific rigor and integrity that the IPCC clearly has not shown, preferring to ignore contrary data as we have described above.

The realizable danger, as we see in climate studies now, is that we are presented with unfalsifiable theories that seem like science. According to Tennekes in a speech in 1986, "No forecast is complete without a forecast of Forecast Skill." In other words the models must be able to reproduce a known data set within a defined level of accuracy without which the forecast is simply a guess. Climate

is such a complex, dynamic, nonlinear, out-of-equilibrium system with so many approximations required that models, based on their observed performance, are useless as predictive devices. Tennekes has pointed out that without the ability to predict changes in precipitation we cannot possibly predict future climate. In figure 8.10 are presented some forecasts from various models of predicted precipitation. There are huge differences in the models, not only in magnitude but also sign such that some areas could be either a desert or a swamp. The models are inadequate in simulating regional effects, particularly when it comes to precipitation.

General circulation models necessarily ignore fundamental issues, partly out of complexity and partly out of lack of

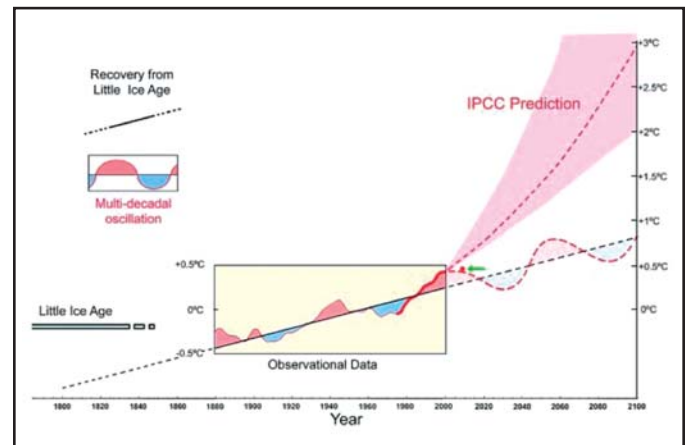


Figure 8.9. This diagram based on a critique by Dr. Syun Akafosu again illustrates the inadequacy of IPCC computer model scenarios, which are essentially straight line projections into the future based on increasing atmospheric CO<sub>2</sub>. The reality is quite different. The red dot with the green arrow is where the observed temperature currently stands. From variations in the temperature record such as the decline from 1940-1975, when CO<sub>2</sub> was actually increasing, Akafosu interprets a multi-decadal oscillation which shows the climate now entering a cooling period (source: <http://wattsupwiththat.com/2009/03/20/dr-syun-akafosu-on-ipccs-forecast-accuracy>).

understanding of systems such as cloud behaviour or Sun cycles. As a result, models in ensemble forecasts lacking proper parameterization of fundamental processes are compared with models that necessarily ignore the same issues. If several such models that are incomplete in fundamental ways are seen to show some agreement, then this



Figure 8.10. The inadequacy of Computer Climate models is demonstrated by an example from the U.S. National Assessment of Climate Change (NACC, 2000). The diagram shows the predicted rainfall for 18 regions of the U.S. These results come from two models. Note the huge differences between model results in magnitude and even sign. For example, the Dakotas (Souris-Red-Rainy) is either a swamp or a desert depending on which model is used. It demonstrates how removed from reality the modelers are when they present results from which the only conclusion is that the models are worthless (source: [http://www.heartland.org/custom/semod\\_policybot/pdf22835.pdf](http://www.heartland.org/custom/semod_policybot/pdf22835.pdf)).

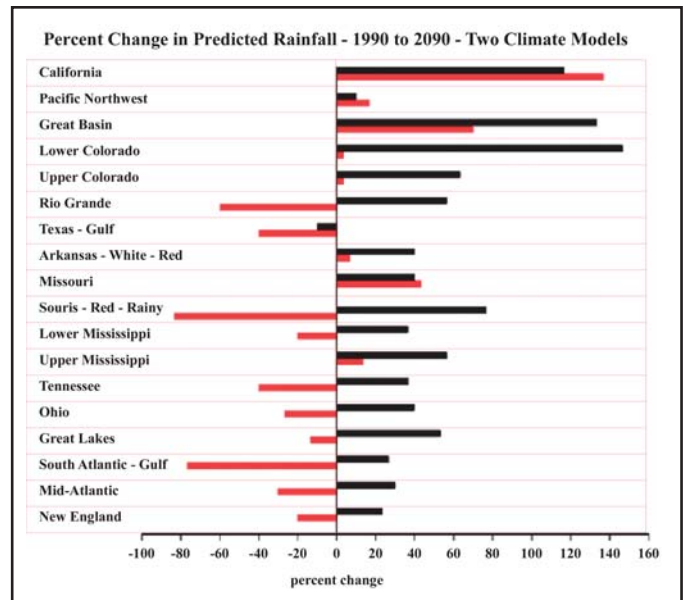
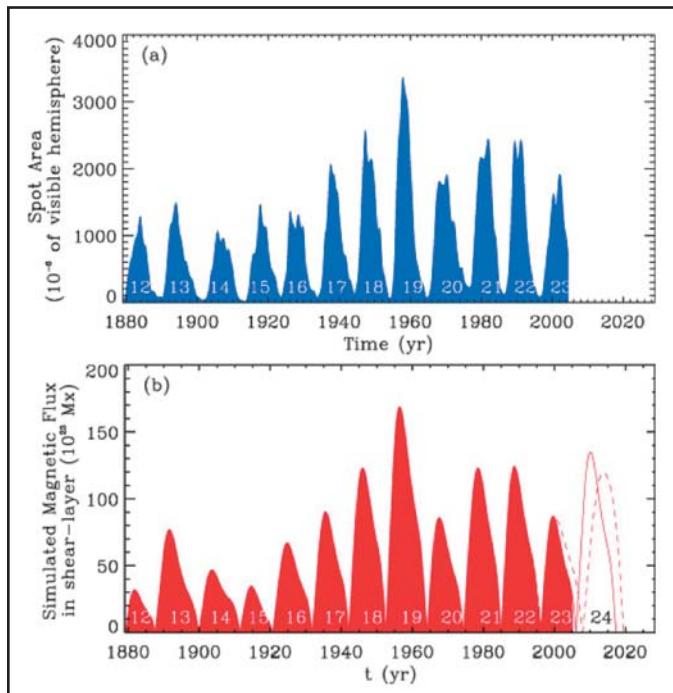


Figure 8.11. Here is clear proof of the dangers of computer modeling even when it includes the requisite estimate of forecast skill. The figures compare observations of the past twelve sunspot cycles (upper figure in blue) with computer simulation of solar processes developed by NCAR scientists (lower panel in red). The fit is almost perfect (98%) and from this a forecast was made for cycle 24 that it would be 30-50% more intense than cycle 23, peaking in 2012 with a sunspot number of 160 plus or minus 25%. In fact, cycle 23 is still in a minimum phase with minimal cycle 24 activity. Far from being more intense, we are now at 637 sunspot-free days, a minimum not seen since the 19th Century, and it is unlikely that cycle 24 will peak before 2014 with a sunspot number less than 50 (source: <http://wattsupwiththat.com/2009/05/30/scientists-issue-unprecedented-forecast-of-next-sun-spot-cycle>).

deemed to be an acceptable result, which we are expected to believe.

Supposedly highly sophisticated climate models have been running for twenty years now at tremendous expense. It has become evident that they have no predictive value whatsoever. In this regard, even when there appears to be a forecast skill of 98%, the outcome can still be wrong. The National Center for Atmospheric Research produced a model which replicated the last 12 sunspot cycles from 1880-2006 (Figure 8.11). On this basis, cycle 24 was predicted to be the most active in recorded history, 30-50% more intense than the current cycle 23. Not only is this forecast wrong, it could be majorly wrong if the Sun continues in its quiescent state. So far cycle 23 has the lowest minimum since the 19th Century and is likely to have a very weak maximum: less than 50 sunspots versus a forecast by NASA of greater than 160. Clearly the assumptions that went into the model neglected a fundamental cyclical element in the generation of sunspots.

Here the comments of Freeman Dyson, one of the world's outstanding physicists, seem particularly prescient, "The models are full

of fudge factors that are fitted to the existing climate, so the models agree more or less with the observed data. But there is no reason to believe that the same fudge factors would give the right behaviour in a world with different chemistry, for example with increasing CO<sub>2</sub> in the atmosphere. Models do not begin to describe the real world we live in nor have they been able to describe our climate history."

It might appear that we have regressed to a situation analogous to the oracle at Delphi where the ululating sound emanating from the rock were interpreted by the high priests as they prophesied the future of the citizens and the country. Are the General Circulation Modelers now the oracular priests prophesying global warming?

#### REFERENCES

Akasofu, Syun-Ichi. 2008. *Is the Earth Still Recovering from the 'Little Ice Age'*. International Arctic Research Center, University of Alaska Fairbanks, [http://people.iarc.uaf.edu/sakasofu/pdf/Earth\\_recovering\\_from\\_LIA\\_R.pdf](http://people.iarc.uaf.edu/sakasofu/pdf/Earth_recovering_from_LIA_R.pdf).

Dyson, Freeman J. 2005. *Winter Commencement Address, University of Michigan. U. of Michigan*

News Service, [www.umich.edu/news/index.html?DysonWinCom05](http://www.umich.edu/news/index.html?DysonWinCom05).

Essex, C., McKittrick, R., and Andresen, B. 2007. *Does a global temperature exist? Journal of Non-Equilibrium Thermodynamics*, v. 32, no. 1, p. 1-27.

Hutton, A. Neil. 2009a. *CLIMATE CHANGE III: Carbon Dioxide. Canadian Society of Petroleum Geologists, The Reservoir*, v. 36, issue 3, p. 38-43, Figs. 1-5.

Hutton, A. Neil. 2009b. *CLIMATE CHANGE V: Here Comes the Sun. Canadian Society of Petroleum Geologists, The Reservoir*, v. 36, issue 5, p. 31-39.

Hutton, A. Neil. 2009c. *CLIMATE CHANGE VI: Fearmongering. Canadian Society of Petroleum Geologists, The Reservoir*, v. 36, issue 6, p. 24-28.

Hutton, A. Neil. 2009d. *CLIMATE CHANGE VII: The Spin Cycle. Canadian Society of Petroleum Geologists, The Reservoir*, v. 36, issue 7, p. 21-25.

Intergovernmental Panel on Climate Change – AR4. 2007. *Climate Change: The Physical Science Basis, Contribution of the Working Group I to the Fourth Assessment Report. Geneva Switzerland*



IPPC-TAR, 2001, *Climate Change: The Scientific Basis. Contribution of Working Group I to the Third Assessment Report*. Cambridge University Press, Cambridge.

Intergovernmental Panel on Climate Change – SAR. 1996. *Climate Change: The Science of Climate Change. Contribution of Working Group I to the Second Assessment Report*. Cambridge University Press, Cambridge.

Intergovernmental Panel on Climate Change – FAR. 1990. *Scientific Assessment of Climate Change. Contribution of Working Group I to the First Assessment*. Cambridge University Press, Cambridge.

Kripilani, R. H., et al. 2003. *Indian Monsoon Variability in a Global Warming Scenario*. *Natural Hazards*, v. 29, p. 189-206.

Loehle, C. L. and McCulloch, J. H. 2008. *Correction to: A 2000-year global temperature reconstruction based on non-tree ring proxies*. *Energy and Environment*, v. 19, no. 1, p. 93-100.

Lorenz, Edward, N. 1963. *Deterministic Non Periodic Flow*. *Journal of Atmospheric Sciences*, v. 20, p. 130-141.

Lorenz, Edward, N. 1979. *Predictability: Does the Flap of a Butterfly's Wings in Brazil set off a Tornado in Texas*. *American Association for the Advancement of Science, Annual Meeting*, December, 29th 1979.

Michaels Patrick, J. 2007. *Meltdown, The Predictable Distortion Of GLOBAL WARMING by Scientists, Politicians, and the Media*. Cato Institute Washington, D.C.

Pieser, Benny. 2007. *The Scientist As Rebel: An Interview With Freeman Dyson*. CCNet, March 14 2007.

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# CLIMATE CHANGE IX:

## *Economics*

by Dr. A. Neil Hutton

In the tide of human affairs, perhaps there is nothing more dangerous than a consensus, a point eloquently expressed by Schopenhauer in the 18th Century, "There is no opinion, however absurd, which men will not readily embrace as soon as they can be brought to the conviction that it is generally adopted." The legitimate concerns regarding the environmental health of the planet have been totally distorted by an evangelistic media and the neo-religious morality of the green environmental activists, who claim that warming will be a disaster. In human history warming never has been a disaster, but the economic effects of attempting to mitigate warming certainly will be disastrous.

By now, in this series of articles, it should be clear that there is no substance to the global warming theory. This is after 20 years of research, four major IPCC assessment reports, and the expenditure of untold billions of dollars in North America and Europe. Estimates indicate expenditures in the region of \$30 billion in the United States, and some \$15 billion in the United Kingdom (Lawson, 2008). Certainly, with some hindsight, this has been an extraordinary misapplication of capital. However, it pales in comparison to what is contemplated in the misguided approaches to saving the planet by reducing CO<sub>2</sub> emissions. In some instances it seems like 'Alice in Blunderland' for some of the ideas are really farcical, but politicians are taking this seriously since they believe that is what the public wishes. Nevertheless, in their political hearts and minds they realise that the task is essentially impossible but they must make the gestures with as little real action as possible.

Let us consider the Kyoto accord which Canada ratified in 2002 and in which the signatories undertook to reduce CO<sub>2</sub> emissions by 5.2% below 1990 levels by 2012.

The agreement called for stabilization of CO<sub>2</sub> emissions by the year 2000. However, the road to hell is paved with good intentions (or obfuscations). By 2003, although the Canadian Government had allotted \$3.7 Billion for climate change related programs; the end result was that CO<sub>2</sub> emissions had grown by 24% above 1990 levels and, by 2006, this had grown to 35%.

Assuming that all of the signatories of the Kyoto accord had actually adhered to their commitment, although none have, with the possible exception of Sweden and deindustrialized Russia, this would have resulted in a reduction in the World's temperature of 0.1°C by the year 2100. This is an insignificant amount to which Canada's contribution would be so small that it barely mattered. In the real world there has been a drop in global average satellite temperature of 0.5°C. Therefore, the climate has achieved a level five times better than the Kyoto target, while atmospheric CO<sub>2</sub> continues to rise significantly. One might think that this would be a wake-up call, if not for the green lobby, at least for the Canadian Government, but they continue to make announcements of additional climate change initiatives as though nothing had changed.

Other than preserving an international high profile as responsible World citizens, Canada's actual ability to impact CO<sub>2</sub> reduction is negligible. While on a per capita basis, Canadian emissions are relatively high (19 tons per capita, Figure 9.1, page 46) this is a cold country, and we are a major producer of hydrocarbons and coal. We rank fourth in the world on a per capita basis (Figure 9.1, page 46) but, on an overall world basis, Canada accounts for only 2% of total emissions (Figure 9.2, page 47). It is perfectly clear that Canada's commitment is simply too trivial to be of relevance without the participation of the World community. More importantly, the costs of attempting increased mitigation are formidable and will significantly damage the standard of living and economic activity of the nation.

Perhaps one of the most extraordinary features of the global-warming frenzy is the fact that governments have committed huge amounts of taxpayers money to investigate and develop technology for carbon capture and sequestration (CCS), but have not spent a penny on any level of due diligence to examine and verify the global warming theory itself. An estimate of funds so far committed to pilot projects and research follows: Canada through the Federal and Alberta Governments – \$3 billion, the Department of Energy in United States on one project – \$2.4 billion, Australia – \$4 billion, EU – \$12 billion on eight projects, Norway – \$600 million, and so on. In new measures before Congress there is a commitment to spend

\$75 billion over the next 25 years. In Australia, a staggering \$22.2 billion is allocated to budgetary assistance for carbon emission-related measures for the next four years.

Initially some studies suggested relatively modest costs per ton for CO<sub>2</sub> sequestration (David and Herzog, 2001). A recent study by the Harvard Business School indicates formidable costs of \$150.00 per ton to scrub, compress, liquefy, and inject CO<sub>2</sub>. This did not include costs for pipeline distribution or storage facilities. This amounted to an additional consumer premium of 10¢/kilowatt-hr, about 2-3 times costs in earlier studies. The U.S. national average for power is 10¢/kilowatt-hr so that CCS including distribution and storage will more than double consumer's electricity costs.

So we now have commitments by governments, to spend at least \$100 billion on CCS, lacking any scientific evidence of the accuracy of anthropogenic Global Warming, other than a series of increasingly inaccurate IPCC forecasts based only on computer climate models. Moreover, the total lack of logic in the whole endeavour is that the CO<sub>2</sub> that we are trying to dispose of originated in the atmosphere in the first place, and was sequestered naturally through geological time to the point that the Quaternary period we now live in has an atmosphere with the lowest CO<sub>2</sub> levels of all past Geological History. If atmospheric CO<sub>2</sub> up to seven times the current levels were not harmful to life in the past, there is no reason to believe that current levels will be now.

The notion that coal and tar sands are dirty energy sources is based on the completely erroneous and completely unproven idea that CO<sub>2</sub> will warm the atmosphere. If this had any real scientific basis and the dangers of warming were real, then CCS may have some merit. Beyond CCS we plunge into a series of murky strategies whose benefits are highly questionable and certainly highly susceptible to economic fraud and scams.

Here we refer to the system of Cap and Trade, nicely defined as the tax that dares not speak its name. The concept is that the government will set an absolute cap on national CO<sub>2</sub> production, after which companies buy, sell, or are allocated permits to emit CO<sub>2</sub>. Over time the cap is reduced



## CO<sub>2</sub> Emissions in 2002

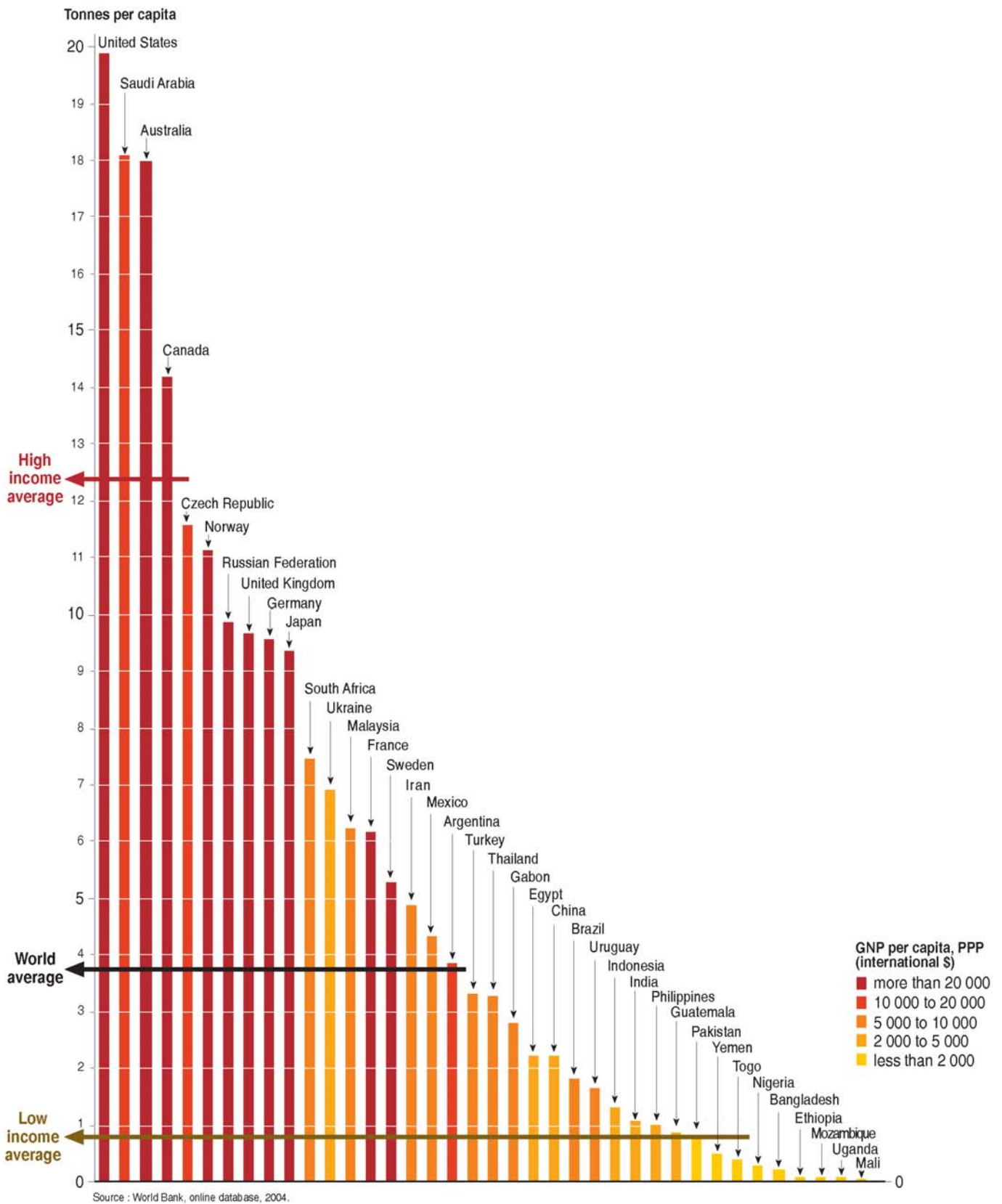


Figure 9.1. National carbon dioxide (CO<sub>2</sub>) emissions per capita. This shows Canada in fourth place calculated in 2004 at 14.5 million metric tonnes per capita, but currently calculated to be 19 million metric tonnes per capita. Emissions are not usually monitored directly, but are generally estimated using models. Some emissions can be measured with only limited accuracy. Emissions from energy and industrial processes are the most reliable while emissions from agricultural activities present major uncertainties. Source: World Bank online data base: UNEP/GRID Arendal ([http://maps.grida.no/go/graphic/national\\_carbon\\_dioxide\\_co2\\_emissions\\_per\\_capita](http://maps.grida.no/go/graphic/national_carbon_dioxide_co2_emissions_per_capita)).

Rank	Country	Annual CO <sub>2</sub> emissions (in thousands of metric tons)	Percentage of total emissions
-	World	28,431,741	100.0%
1	China	6,103,493	21.5%
2	United States	5,752,289	20.2%
-	European Union	3,914,359	13.8%
3	Russia	1,564,669	5.5%
4	India	1,510,351	5.3%
5	Japan	1,293,409	4.6%
6	Germany	805,090	2.8%
7	United Kingdom	568,520	2.0%
8	Canada	544,680	1.9%
9	South Korea	475,248	1.7%
10	Italy	474,148	1.7%
11	Iran	466,976	1.6%
12	Mexico	436,150	1.6%
13	South Africa	414,649	1.5%
14	France	383,148	1.4%
15	Saudi Arabia	381,564	1.3%
16	Australia	372,013	1.3%
17	Brazil	352,524	1.2%
18	Spain	352,235	1.2%
19	Indonesia	333,483	1.2%
20	Ukraine	319,158	1.1%
21	Poland	318,219	1.1%
22	Thailand	272,521	1.0%
23	Turkey	269,452	1.0%
24	Kazakhstan	193,508	0.7%
25	Malaysia	187,865	0.7%
26	Argentina	173,536	0.6%
27	Venezuela	171,593	0.6%
28	Netherlands	168,513	0.6%
29	Egypt	166,800	0.6%
30	Pakistan	142,659	0.5%
31	United Arab Emirates	139,553	0.5%
32	Algeria	132,715	0.5%
33	Uzbekistan	115,672	0.4%
34	Czech Republic	116,991	0.4%
35	Belgium	107,199	0.4%
36	Vietnam	106,132	0.4%
37	Romania	98,490	0.4%
38	Nigeria	97,262	0.3%
39	Greece	96,382	0.3%
40	Iraq	92,572	0.3%
41	Kuwait	86,599	0.3%
42	North Korea	79,111	0.3%
43	Austria	71,834	0.3%
44	Israel	70,440	0.3%
45	Belarus	68,849	0.2%
46	Syria	68,460	0.2%
47	Philippines	68,328	0.2%
48	Finland	66,693	0.2%
49	Colombia	63,422	0.2%
50	Chile	60,100	0.2%
51	Portugal	60,001	0.2%
52	Hungary	57,644	0.2%
53	Singapore	56,217	0.2%
54	Libya	55,495	0.2%
55	Denmark	53,944	0.2%
56	Serbia and Montenegro	53,266	0.2%
57	Sweden	50,875	0.2%
58	Bulgaria	48,085	0.2%
59	Qatar	46,193	0.2%
60	Morocco	45,316	0.2%
61	Turkmenistan	44,103	0.2%
62	Ireland	43,806	0.2%
63	Switzerland	41,826	0.2%
64	Bangladesh	41,609	0.2%
65	Oman	41,378	0.2%
66	Norway	40,220	0.2%
		<b>Total: 97.5%</b>	
<b>Remaining 143 countries each contribute 0.1% or less</b>			

Figure 9.2. This shows the list of countries by emissions in metric tonnes. The world's total emissions of CO<sub>2</sub> are 28 billion tonnes, of which the United States and China produce 42%. These countries, together with the European Union, Russia, India, and Japan account for 71% of the world's emissions. Canada's production of only 545 million tonnes accounts for only 2% of the world's total CO<sub>2</sub> emissions. Therefore, Canada's ability to influence total emissions is negligible. Source: United Nations, Energy Emission Administration.

to reduce carbon emissions. The US Congressional Budget Office has calculated that the "TAX" would amount to only \$175.00 a year for a family of four, but this is in the years up to 2020 and then things really get serious. When our current politicians are drawing their comfortable pensions, the average family of four are facing \$1,870 additional electric bills per family. Under the new US Waxman Markey Bill this will rise to \$6,800 by 2025. This is an energy price tsunami that the economy simply can not sustain. Furthermore, the pain will not be shared evenly as it is relative to the reliance of states and countries on energy sources with different CO<sub>2</sub> emission potentials such as coal, natural gas, hydro, nuclear, and oil. The poor, however, who have to devote proportionately more of their disposable income to energy, have the most to lose.

Although "Cap and Trade" is presented as a market solution to the CO<sub>2</sub> emission problem, in practice it is a government-rationing scheme in which the rations can be subsequently traded. The nature of the system is that rations will become scarcer and permits more expensive. This will no doubt result in intense commodity price shocks in the future. From a more realistic and pragmatic perspective, the funds might better be allocated to mitigating and adapting to the effects of warming should they actually occur.

For the "Cap and Trade" market-makers and other middlemen, trading in CO<sub>2</sub> emission permits it is an unprecedented bonanza, with no economic value added, which will come with the usual unintended consequences of entrepreneurial schemes and scams. The administrative allocation system does not score highly on transparency, and will lend itself to lobbying, corruption, and abuse of one kind or another. Cap and trade is distortionary, covering mainly emissions coming from the generation of electrical energy and refining and production of hydrocarbons, but not others, such as the entire personal and household sector, including automobiles.

The EU has some experience of such a scheme, the Emissions Trading Scheme (ETS) that was initiated in 2005 and in its first three years resulted in no drop in emissions. Instead, the facilities under ETS administration, emissions actually increased by 8%. In the first phase, the embarrassing revelation was that more permits had been issued than there was 'pollution'. Although the ETS administration declares that they have learned their lesson and will tighten up on permit allocations, this can probably not be policed, since member States can 'import' external 'Kyoto credits' from developing countries in order to meet their target for reductions. This might be acceptable if these represented real emission cuts. However, in many instances, the credits have been shown to be flawed or simply fraudulent, yielding no true emission reduction. As well, many credits are purchased from developing countries that would have credits they don't need so that there is no reduction but an increase in emissions. The opportunities for malfeasance are endless, while the financial incentives to do so are considerable for both parties. In general, with the exception of those who made money, the ETS is widely regarded as a farce. In order to provide greater



transparency it was recommended that all of the permits should be auctioned. The result? The EU decided that 98.5% of the permits should be allocated and a massive 1.5% auctioned. Here a cynic might well conclude that politicians are unwilling to give up the perk of being lobbied so that campaign funds will be contributed.

Another arrangement under the Kyoto agreement is the Clean Development Mechanism (CDM) under which, a country, that is unable to meet its emissions target, can buy 'certified emission reductions' (CERs) from developing countries instead. The certification of the reductions is, in theory, done by the United Nations, but in reality the system is impossible to police. Various newspaper investigations have shown the CDM did not reduce emissions and were little more than a massive scam (Davies, 2007, The Guardian, UK). In this same philosophy was the Joint Implementation mechanism in which countries with emissions below their Kyoto targets can sell 'carbon credits' to developed countries unable to meet emission targets. As it happens, Russia is the only developed country in this position. Indeed, it has been suggested that Russia's late ratification of Kyoto was motivated by the prospect of earning billions of dollars selling 'carbon credits', not because of any innovation, but because of the collapse of the old Soviet Military Industrial machine in the 1990s. Now Russia's emissions are well below the Kyoto 1990 benchmark. Does Russia's ability to sell credits now really change the level of CO<sub>2</sub> emissions?

It is unlikely that any of these schemes will make any difference to the climate, but the politicians and scientist have created a climate of anxiety and guilt. And like the medieval church selling indulgences you can now purchase 'carbon credits' in order to assuage your guilt by reducing your carbon footprint. This is a private sector response to the emission issue. It has both a personal and corporate dimension: corporations can claim to be 'carbon neutral' by claiming to have purchased 'offsets' in the form of emission reductions elsewhere, or of CO<sub>2</sub> absorption through the of planting trees. On an individual basis the schemes available usually revolve around the planting of trees. Once again investigative journalism suggests that there is a high level of fraud involved. The trees allegedly planted, may not have been; if they have been, it was not on the basis of new offsets, or the credit has been double dipped. Either way their carbon absorption is notional, unverified, and at best some years into the future.

Descending further into the realm of farce is the revelation that researchers at the University of Alberta are developing cattle

that produce significantly less methane per bodyweight than regular cattle. Thus the owners of fart-less herds will be able to sell carbon credits to owners of regular fart-a-lot cattle herds. One wonders what can be achieved here on a personal basis if you have the correct metabolism? The concerns about the use of fossil fuels has spawned a wide range of alternative energy proposals. To this date none can compete with the use of fossil fuels and without heavy subsidization by government would never be undertaken. First up is wind power, which at first sight would seem like a natural contender and has received considerable attention and investment. The fundamental problem is that the wind does not blow consistently. As well there are physical attributes of wind which are unfavourable. The kinetic energy of wind is determined by the specific mass of air (very light at 1.18 kg/m<sup>3</sup>) times the cube of the velocity times a constant. That is to say  $E=C*M*V^3$ . The final term is the one that creates the major problem since velocity cubed creates a variability that makes it impossible to estimate the number of kilowatts that will be generated at any given moment, or the number of kilowatt hours in a given period. Thus it is impossible to provide a production factor / capacity factor for a wind turbine. It will always be guesswork. An additional problem in practical operations is that turbines are shut off from the grid at wind speeds less than 20-30km/hr, while for safety reasons the units are shut down at speeds over 60km/hr. Maximum efficiency usually occurs in the 50-60km/hr wind speeds (Halkema, 2006).

An excellent illustration of the problem is shown in Figure 9.3, which shows variations in the power of a single wind turbine. There is clearly seasonality in the wind power but even in the winter months, fluctuations from a maximum 600kw to under 200kw can occur within a few minutes or hours. This is certainly not a reliable supply of consumer electricity. Building of a large number of turbines does not resolve the problem. Figure 9.4 illustrates the power spectrum from 7,000 wind turbines spread over several thousand square kilometres from the North and Baltic Seas to the Austrian-Swiss border. Variations occur between 0.2 and 38.0 of the grids daily peak load, creating real problems in establishing a stable electrical grid. It also demonstrates that distributing wind turbines over a wide area does not prevent extreme and random variations in wind power. The fundamental issue is that for every kilowatt of generation by wind requires an equivalent backup of conventional generation. So why increase your capital costs by building wind turbines in the first place?

Shell announced in March this year that they

would no longer invest in renewable energy projects such as wind since they are not economic (Tim Webb, The Guardian, UK, 17 March, 2009). Denmark has also indicated that their experience with wind turbines is that, in fact, they increase emissions because they require equivalent backup in conventional generation and provide poor economies in capital costs.

In the United States, Boone Pickens has backed off a major investment in a proposed plan to build the world's largest wind farm in the Panhandle of Texas. Pickens cites the drop in oil and natural gas prices, difficult credit markets, lack of access to transmission lines, and uncertainties regarding government tax credits. The American Wind Energy Association (AWEA) reported the industry invested \$17 billion on new wind energy capacity to create roughly 8,545 megawatts of electricity. This would have the 'potential' to meet the needs of 6.8 million American homes provided there is equivalent backup capacity! There has been a major drop in construction as the industry awaits clarification of new tax credit rules by the Obama administration.

The story on renewable energy technologies is rather similar to wind power. Perhaps wishful thinking together with government subsidies is the driving force in these enterprises. The IPCC claimed in its Climate Change 2001 report that "known technological options could achieve a broad range of atmospheric CO<sub>2</sub> stabilization levels, such as 550ppm, 450ppm or below over the next 100 years or more...". The known technological options refer to technologies that exist in operation or pilot stage today. It does not include technologies that will require fundamental technological breakthroughs.

One of the most thorough reviews of the world's possible energy future appeared in an article by a team of energy scientists drawn from academia, government, and industry: "Advanced Technology Paths to Global Climate Stability" in Science's Compass Feature in November 2002. The lead author was Martin J Hoffert, a New York University physicist. The conclusion of Hoffert and his team was that cutting CO<sub>2</sub> would require Herculean efforts, since CO<sub>2</sub> is a key element of modern society that "can not be regulated away." Furthermore, contrary to IPCC, they conclude that the availability of CO<sub>2</sub> emission-free power requirements is not supported by the team's assessment. In other words, the IPCC has made a supposedly scientific statement that is totally at odds with the realities of energy generation.

The problems of renewable energy sources,





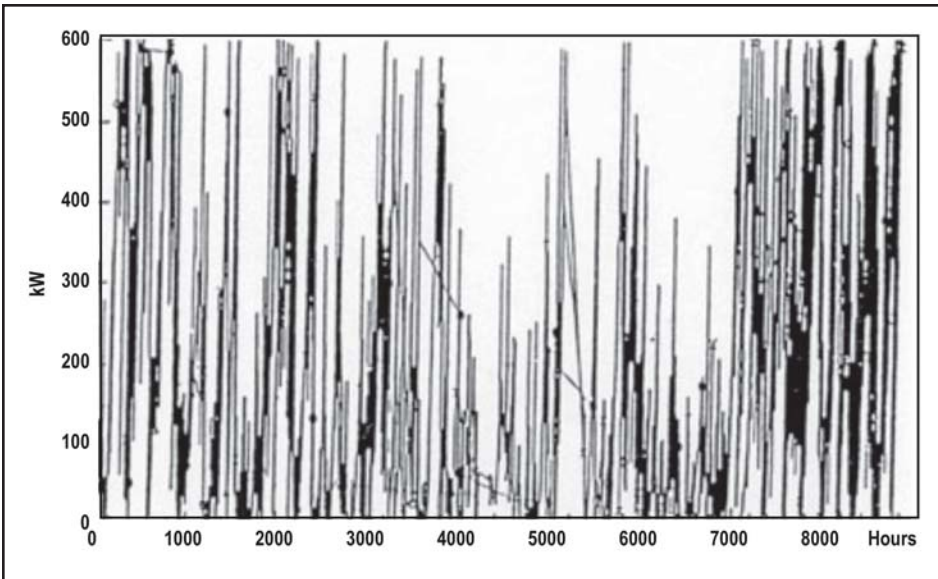


Figure 9.3. The figure demonstrates the variations in wind power of a single 600 kW wind turbine situated very close to the North Sea coast in the Netherlands, as measured over a full year (8,070 hours). Note the highly irregular pulsating nature of the output. It is clear that the kinetic energy of wind makes the prediction of output / production of a wind turbine impossible. It is always guesswork. Source: Halkema, 2006, p. 6, Figure 1.

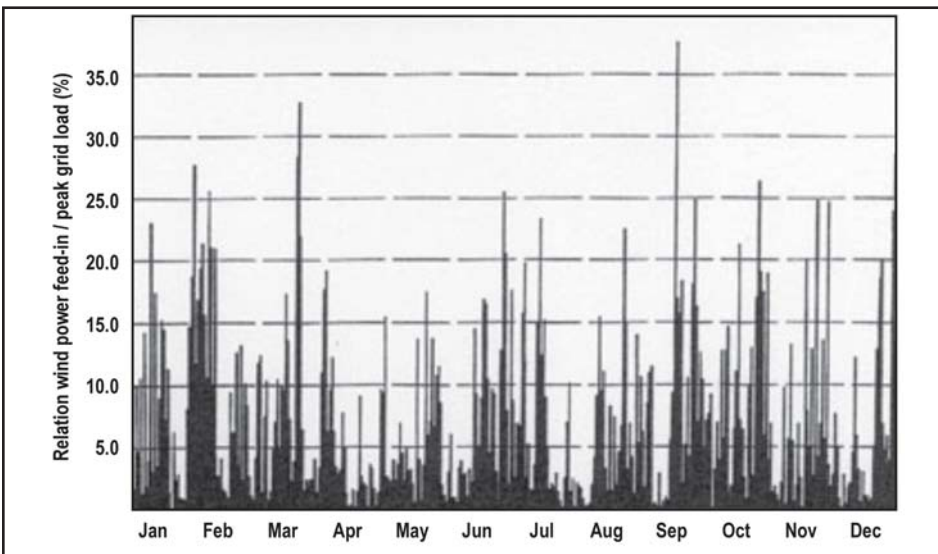


Figure 9.4. This figure bears a striking resemblance to Figure 9.3, which shows output variations for a single wind turbine. However, the figure shows the same pulsatory behaviour despite the fact that in this case the output is from 7,000 wind turbines distributed from the North Sea and Baltic Sea to the German Swiss border. Distributing large numbers of wind turbines over a wide area does not help to prevent random and extreme variations in total wind power. Therefore, it can never provide a reliable supply of consumer electricity. Source: German Eon Netz Wind Report, 2005, after Halkema, 2006, p. 7, Figure 2.

according to the Hoffert team, are that they have very low power densities, as we have discussed above in the case of wind. The problem becomes one of land use. The average coal-fired plant of 680-1,500 megawatts requires only a few acres for its construction and production. On the other hand, wind turbines to produce the equivalent power need up to 1,000 turbines on a spacing of between 50 and 100 acres per turbine, requiring some 100 to 150 square miles of land to produce on an essentially intermittent basis only about 1.5% of the required annual

increase to the grid. Wind power is simply feel good window-dressing meeting none of the requirements for CO<sub>2</sub> emission-free energy. The backup requirement of wind power together with the capital cost causes a complete nullification of the supposed benefit in emissions and economics.

At the present time global power consumption is about 12 trillion kilowatt-hours per year, of which 85% is fossil-fuelled. Future demand by 2052 could be in the range of 10 to 30 trillion kilowatt-hours per year.

The problems for the other renewable energy sources are very similar to wind. The Hoffert team suggests that to produce 10 trillion kilowatt-hours per year from biofuels would require 15 million square kilometres of cropland, which is simply not available. For example the use of America's high-yielding cornfields to produce ethanol, instead of food, produces a net of only 50 gallons per acre per year after subtracting up front costs for seed, fertilizer, fuel, and processing. Thus in order to meet any significant volume of the US consumption of 134 billion gallons of gasoline per year through the use of corn ethanol, America would have to clear up to 100 million acres of forest land. The recent run-up in world food prices creating a crisis in the developing nations has demonstrated the failure of subsidised ethanol production policy.

The Hoffert team also points out that, with current solar panel technology to produce 10 trillion kilowatt-hours of electricity, another 220,000 square kilometres or so of land to accommodate the photovoltaic arrays together with the land for the associated transmission lines, service roads, maintenance roads, and so on is required. If one adds up the land requirements for the low-density renewable energy technologies, we are looking at continental land areas equivalent to South America (22 million square kilometres), China (10 million square kilometres), and India (3 million square kilometres). It is clear that current alternative energy are not feasible without major technological breakthroughs in solar panel design and efficiency and in biofuel technology, while wind power is simply not economically viable.

Although, probably an unpopular view with the green lobby, the Hoffert team's conclusion was in support of more intensive technological solutions. In particular, they conclude that the way forward is through nuclear energy. Specifically, these experts want nuclear fission and breeder reactors with the ultimate goal of achieving fusion. Breeder reactors are currently illegal in the United States because of concerns regarding waste disposal and production of weaponsgrade material. However, the benefits are that breeder reactors can produce more fuel than they consume, and can, after initial start-up, use thorium which occurs in the earth's crust at a level four times that of uranium. Some believe that the future lies with reprocessing spent fuel and the use of breeder reactors in such a way that fission reactors could be effective for thousands of years.

Unfortunately, an ill-informed public, an irresponsible media, and vote-seeking



politicians are diverting public attention and major capital investment from the real priorities for the future. Greater energy efficiencies at all stages of our activities are necessary so that we optimize the use of fossil fuels, abandon the rash uneconomic investments in so-called CO<sub>2</sub> emission-free renewable energy, and invest in research into energy solutions that are economic and can meet our future needs for energy. The diversion of intellectual energy and capital investment into the global warming scare will be viewed with astonishment and disbelief in the future. It also stands as a monument to the need for intellectual freedom and the ability to sustain open scientific debate.

#### REFERENCES:

Barnes, Greg. 2009. *Climate Change Industry Help a Bottomless Pit*. *Business The Age*, May 30, 2009. <http://business.theage.com.au>.

David, Jeremy and Herzog, Howard. 2001. *The Cost of Carbon Capture*. Massachusetts Institute Technology, Cambridge, MA, USA. Presented at 5th International Conference on Greenhouse Gas Control Technologies.

Halkema, J. A. 2006. *Critique of Windpower and the UK Wind Resource*. *Energy and Environment*, v. 17, no. 4.

Hoffert, M. I. 2002. *Science Compass: Advanced Technology Paths to Global Climate Stability: Energy for a Greenhouse Planet*. *Science*, v. 298, p. 981-87.

Lawson, Nigel. 2008. *An appeal to reason – a cool look at global warming*. Overlook Duckworth, Peter Mayer Publishers Inc. New York, Woodstock, and London.

Malone, Scott. 2009. *Pickens' pullback could signal shift in the wind*. *Globe and Mail, Globe Investor*, July 08, 2009, [www.globeinvestor.com](http://www.globeinvestor.com).

Singer, S. Fred and Avery, Denis T. 2008. *Unstoppable global warming*. Rowman and Littlefield Publishers Inc, Lanham, Maryland.

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# CLIMATE CHANGE X:

## *Afterword*

by Dr. A. Neil Hutton

One might wonder how a society that could send men to the moon, explorers to Mars, and develop amazing remote sensing technology is unable to develop an appropriate scientific evaluation of climate. The answer is probably that there was an arrogant underestimation of the complexity of climate, together with a naive attempt to reduce climate to the variability of one minor trace gas – ignoring all prior history of climate variability and atmospheric CO<sub>2</sub> content.

The IPCC has created, with the cooperation of the media, the impression of thousands of committed objective scientists of impeccable integrity. Supposedly, these experts, reinforced by extensive peer review, have a high moral intent to save the world from the potential Armageddon of warming. The reality is totally different! The IPCC gathered together many meteorologists, climatologists, environmentalists, and political activists. These are the people claimed to be the 2,500 leading scientific experts constituting the consensus. In fact, in IPCC's Fourth Assessment, a head count shows that there were 1,656 authors; some of whom were involved in many parts of the report using given names in some parts, initials in others, and an abbreviation in another. If one goes to the trouble of examining the author's biographies, it emerges that of the some 1,190 separate individuals who wrote the scientific part of the report, many were not scientists but were political and environmental activists. For example, those who authored the publication of the chapters on the health effects of global warming had no formal expertise in the chapters' subject material (Lindzen, 1992). Indeed the published expert opinions of tropical disease scientists were ignored in a recurring and constant pattern of IPCC reports. There was never a multidisciplinary effort to determine the oscillatory nature of climate change, its history, and its principal drivers.

A proper understanding of climate requires an amalgamation of disciplines such as astronomy, astrophysics, solar physics, geology, geochronology, geochemistry, sedimentology, tectonics, palaeontology, palaeocology, glaciology, climatology, meteorology, oceanography, ecology, archaeology, history (of plagues, famines, economic data on agricultural commodities,

land use, crops, etc.), and, last but certainly not least, statistical analysis. The problem, in the beginning, was that this was never intended to be an objective analysis, and other disciplines were deliberately excluded. Led by the apocalyptic vision of Maurice Strong, the IPCC was formed under the United Nations with the specific objective of proving that man-made emissions of Carbon Dioxide would wreak havoc on the world's climate. This was achieved through the masterminding of conferences in Stockholm, Rio, Kyoto, Johannesburg, Bali, and the coming Kyoto II in Copenhagen in December.

The World Meteorological Association through the auspices of the United Nations became the driving force in the process of establishing that global warming was the result of human activities. While one might conclude that the WMA were exactly the right people for the assignment, there is a problem. Philosophically, the meteorological profession is in the business of forecasting weather, and, therefore, take a forwardlooking approach to weather, and, in turn, climate. Yesterday's forecast is no longer relevant. This philosophy arrived at a time of tremendous developments in technology, satellite imagery, Doppler radar, and – perhaps worst of all – supercomputers. Despite the work of Edward Lorenz, (*The Butterfly Effect*, 1979), and the cautions of outstanding scientists such as Henrik Tennekes (1986, 1992), Freeman Dyson (2005), and others (Hutton, 2009d) climate research has relied exclusively on computergenerated climate models whose predictions prove nothing and are evidence of nothing.

Science requires evidence derived from observation, measurement, and experiment. Only two measurements have been presented by IPCC, the rise of atmospheric CO<sub>2</sub> versus the ground-based global average temperature curves, as presented by the Goddard Institute for Space Studies (GISS) and Hadley Climate Research Unit (HADCRUT). The ground-based temperature observation stations were never constructed for the purpose of climate research. Apart from the fact that a majority of the thermometers are improperly located adjacent to heat sources (Hutton, 2009a), they also exhibit an extreme geographical bias as the majority of the thermometer records are located within the industrialized

nations of the Northern Hemisphere and are so strongly influenced by the Urban Heat Island effect that the bias can not be removed. Although it is claimed that the data has been corrected effectively, the confidence in this assertion has been profoundly shaken, first by Steve McIntyre's work, which showed that the GISS data contained errors such that the Thirties were the hottest decade not the Nineties and, second, the persistent refusal of Dr. Phillip Jones of the Climate Research Unit, University of East Anglia, to release the raw data, which was the basis for the HADCRUT3 global average temperature curve. This is a completely unacceptable situation preventing analysis and replication by independent researchers and makes a complete mockery of peer review. But this is not the only incident where a refusal to respect normal scientific protocols and transparency has occurred. The exposure of the Mann, Bradley, and Hughes hockey stick occurred only because, over the refusal of the authors to release the data, they were finally legally forced to provide the data by the terms of their government research grant. Furthermore, the fact that this infamous graph was published and accepted by the IPCC, and continued to be used years after it had been completely discredited demonstrates conclusively the complete lack of integrity and scientific objectivity in the IPCC.

The totally political nature of IPCC was clearly demonstrated in the Fourth Assessment report (AR4) in 2007 where, having been forced to relinquish the 'hockey stick' – which was done without explanation – they then produced a curve starting in 1850 (Hutton, 2009a). This was as if God created the world in 1850 and before that there was no climate. Of course, this extraordinary manipulation was done in order to avoid acknowledgement that there were climate oscillations comparable to and warmer than those of the 20th Century. In Figure 10.1 (page 52) are documented no fewer than 15 climate oscillations since the last ice age. The selection of 1850 in the Little Ice Age was chosen only so that they could show rising atmospheric CO<sub>2</sub> along with a temperature recovering from the cold of the Little Ice Age. But what of the climate of the last 500 million years? Was it not cyclical? Were there not warm periods and cool periods – even greenhouses and icehouses and was this caused by atmospheric CO<sub>2</sub>? The answer is



Post Pleistocene Climate Cycles	
Pleistocene Ice Age	108,000 - 12,700BC
Rolling	12,700 - 11,900BC
Older Dryas	11,900 - 11,600BC
Allered	11,600 - 10,900BC
Younger Dryas	10,900 - 9,600BC
Holocene Warming	9,600 - 6,300BC
Egyptian Cooling	6,300 - 6,000BC
Holocene Warming	6,000 - 3,600BC
Akkadian Cooling	3,600 - 1,500BC
Minoan Warming	1,500 - 1,200BC
Bronze Age	1,200 - 500BC
Roman Warm Period	500BC - 535AD
Dark Ages	535 - 900AD
Medieval Warm Period	900 - 1300AD
Little Ice Age	1300 - 1850AD
Modern Warm Period	1850 - 2009AD

Figure 10.1. Post Pleistocene Climate Cycles since the end of the last glaciation. There are fifteen climate cycles, which are documented from archaeology; history; sedimentology; palinology; and oxygen, carbon, and beryllium isotope studies.

clear and unequivocal: there is no correlation between atmospheric CO<sub>2</sub> and Phanerozoic climate. There is no correlation in the last decade; the climate is cooling while atmospheric CO<sub>2</sub> continues to increase. The UAH global average satellite temperature in the troposphere shows that the temperature is 0.5°C below the IPCC forecasts in AR4 (Hutton, 2009d). This may not sound like a large difference but within one decade it is substantial. Furthermore, the temperature is now actually lower than the IPCC forecasts in the AR4 report where it was assumed there would be no further additions of CO<sub>2</sub> (Hutton, 2009d).

Then there is the information from the rest of the world that is not reported by the western media in an unspoken form of censorship. In Japan in February a report was presented by the Japan Society of Energy and Resources (JSER), which acts as an advisory panel to the Japanese Government. The report concluded that global warming was not man-made. The report is a complete rebuttal of IPCC methods and conclusions. In short, while CO<sub>2</sub> is increasing the climate is cooling contrary to all predictions. The authors concluded that there was undue reliance on land-based thermometer data with its bias induced by the urban heat island effect and the highly skewed nature of the recording stations. The report bluntly

criticized the reliance on computer climate models due to the lack of understanding of climate systems, especially humidity and cloud. The JSER report indicates that the models lack the input of fundamental processes so that they are unsupported hypotheses presented as truth – no more reliable than astrology, according to one author.

Meanwhile in the United States, it has emerged that the Environmental Protection Agency (EPA) withheld a report by one of its staff questioning the validity of Global Warming Science. Alan Carlin argued that since EPA is ultimately responsible for environmental policy it should not simply accept the IPCC data but undertake its own independent enquiry. The study was suppressed and the author Carlin transferred to other duties. The Carlin report is a sound and well reasoned document which can be viewed at [http://cei.org/cei\\_files/fm/active/0/DOC065209](http://cei.org/cei_files/fm/active/0/DOC065209). The study was conveniently withheld ahead of the House vote on the Waxman Markey Bill (Cap and Trade), which passed by a narrow margin. The bill potentially would be the greatest tax increase in US history. However, the bill appears to have little chance of passing in the Senate, where the Democrats are deeply divided on the issue and Senator Imhofe (Republican) is demanding an enquiry into the suppression of Carlin's report.

The reliance of the IPCC on surface thermometer data and its lack of correspondence with other observations such as the UAH Global Average Satellite data from NASA satellites or correlation with sun-spot cycle length from the Eighties onward, has led to requests to review the raw data from HADCRUT3, the data interpreted by the Hadley Research Centre, at the University of East Anglia. This data set curated by Dr. Phillip Jones has been marked by his consistent refusal over many years to release the data. He will not provide the computational algorithms used to process the data, nor will he cooperate with other scientists or reveal any of the assumptions he has made. He has even gone so far as to indicate an unwillingness to cooperate with the World Meteorological Organization. Jones' determination not to reveal the data suggests that he is aware that it will not withstand scrutiny. A scientist confident of his work would be happy to cooperate.

Now the determination of the academic community is matching Jones' obduracy and so he is inundated by requests under the Freedom of Information Act. However, he suddenly remembers that he had entered into confidentiality agreements with a number of countries and is unable to provide

the data. This provoked a request to view the agreements. It then turned out that some of the agreements were verbal and the documents for the other arrangements were lost during a move! This is the level of scientific integrity and transparency in the IPCC, and this is only one of several other incidents.

Unrest continues in the scientific community. In July a group of some 40 German scientists from the European Institute for Climate and Energy forwarded a letter to Chancellor Merkel indicating that there is no evidence to support anthropogenic warming and they therefore were requesting a complete review of climate science and especially the associated economic policies.

In the United States, scientists are similarly challenging their Societies' support of anthropogenic global warming. The American Chemical Society (ACS, claimed to be the largest scientific society in the World) was shaken by the response of their members to an article in their news magazine, Chemical and Engineering News, by the editor-in-chief Rudy Baum. The article claimed that it was increasingly difficult to challenge the consensus view of global warming despite the efforts of climate change deniers, and also that climate change deniers were attempting to derail meaningful efforts to respond to climate change. The appearance of the article was greeted with an immediate and overwhelming scientific rebuke from Baum's colleagues. Almost without exception the letters castigated Baum's climate change views, objected to the pejorative term "deniers" because of the holocaust connection, and, further, rated the editorial as "disgusting," a "disgrace," "full of misinformation," and unworthy of a scientific periodical. Many writers called for Baum's dismissal. Baum himself acknowledged that he was startled and surprised by the contempt and vehemence of the ACS scientists to his view of Global Warming consensus. To view these letters go to <http://acs.org/cen/letters/87/8730/letters.html>.

The American Physical Society has been challenged in an open letter from 80 of its members to revise their National Policy Statement on Climate Change. The proposed statement simply removes anthropogenic warming as a causative mechanism of climate change. The recommended revision is available at: [http://icecap.us/images/uploads/APS\\_openLetter\\_07\\_29\\_09.pdf](http://icecap.us/images/uploads/APS_openLetter_07_29_09.pdf).

Then to Australia where we have a real scientist capable of independent analytical thought and outstanding scientific scholarship who has wrought major changes in attitudes down-under as a result of his



recently published book, "Heaven and Earth, Global Warming, the Missing Science". The author Professor Ian Plimer, from the University of Adelaide is twice winner of Australia's highest scientific honour, the Eureka prize. The book is a masterly piece of scholarship of multidisciplinary range and breadth, fully documented by 2,300 peer-reviewed references. This book is required reading for anyone who really wants to understand climate science and understand the inadequate and scientifically unsupportable claims made by IPCC reports.

As a result of Plimer's book, the Australian Senate refused to pass the Cap and Trade legislation proposed by the Rudd Government in August. Now the Bill must be amended through negotiation with the Senate. If the legislation is again defeated then Rudd would be required to call a general election.

Coming home is somewhat disappointing since it appears from correspondence that the Federal and Provincial Governments fully support the IPCC 2007 AR4 Assessment. This could be viewed simply as a move to appease the environmental vote. on the other hand, we should be concerned because Canada, along with the G8, signed on for the proposal that the Nations would work to maintain a global average temperature no more than 2°C above pre-industrial levels. Using the Global Average Temperature from the Hadley Centre which extends back to 1850 (Figure 10.2), there is a trend of warming from 1850 until the 1998 El Nino, after which temperatures have been declining approximately 0.5°C below 1998 maximum. This would indicate that we have leeway of about 1.5°C over pre-industrial levels and since the climate is cooling there appears to be no urgency to rush into the so-called mitigation strategies of cap and trade (CT), carbon capture and sequestration, (CCS), carbon credits for offset reductions, and a completely unnecessary bureaucracy. one can detect the vultures wheeling in the sky readying to feed off the new carbon economy, essentially the carcass of the taxpayers. Law firms and consultants are busying themselves to lead you through the maze of carbon regulation so that you can establish and maximize the carbon assets in your business – and none more so than Al Gore.

In 1998 Fortune Magazine derisively declared that Gore's financial acumen, "Ain't Worth a Bucket of Warm Spit" at the time his net worth was little more than the vice Presidential income. Now since leaving politics he has a net worth in excess of US\$100 million. It appears that many expect him to become the first carbon billionaire through his stakes in a global-warming hedge

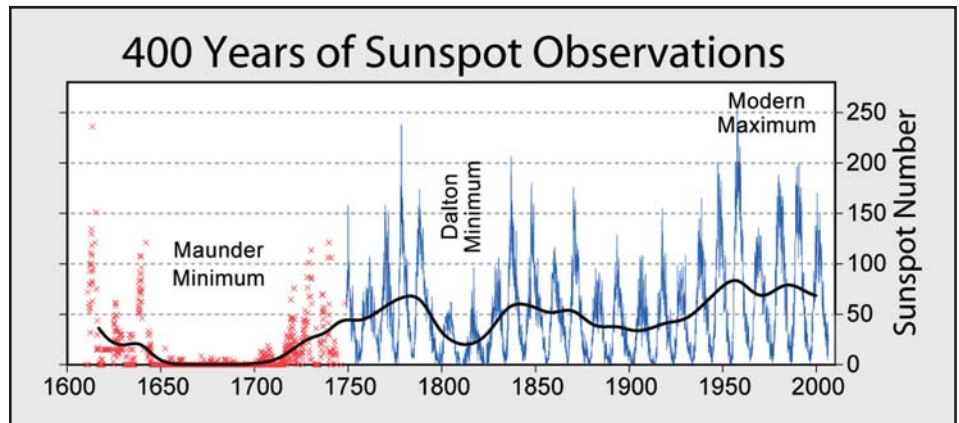


Figure 10.2. 400 Years of Sun-spot Cycles. The heavy black line is the eleven-year mean of the monthly averages of the sun-spot numbers. The general correspondence of this average with known climate is excellent. The Little Ice Age coincides with the extent of the Maunder and Dalton Minimums and in fact extends to 1350 as a result of the Sporer Minimum. The increased activity in the later part of the 20th Century is striking and it even includes the cooling from the late Forties to the mid-Seventies. This cooling is not reflected in the atmospheric CO<sub>2</sub> content. Source: [http://en.wikipedia.org/wiki/File:Sunspot\\_Numbers.png](http://en.wikipedia.org/wiki/File:Sunspot_Numbers.png). This figure was prepared by Robert A. Rohde and is part of the Global Warming Art project.

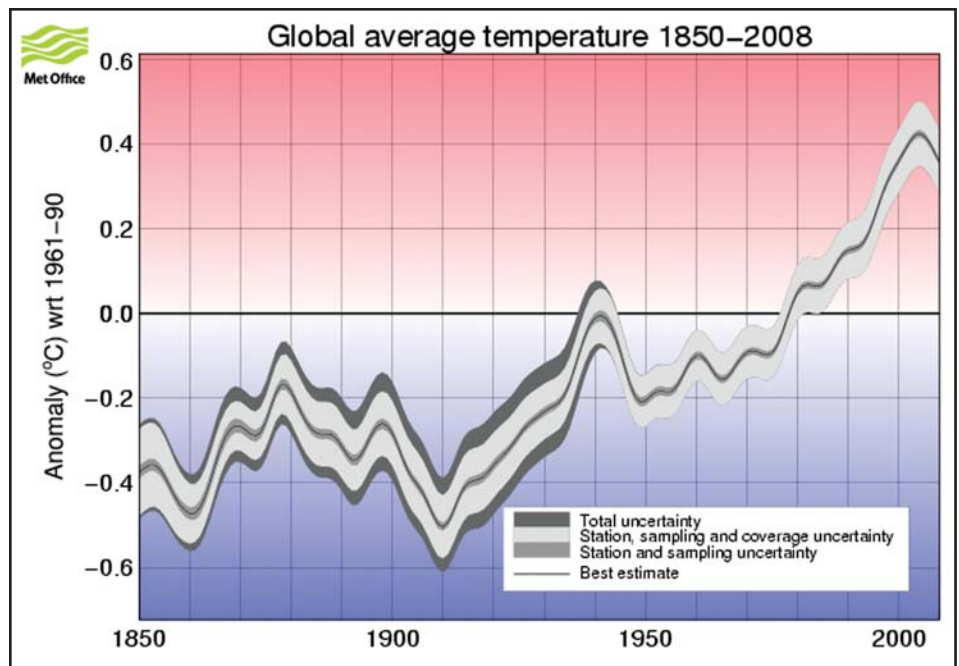


Figure 10.3. The Global Average Temperature from 1850-2008. This data set is in doubt because of the sudden sharp increase in temperature starting in the Eighties, which is not shown on the satellite temperature curves. Furthermore, data plotting the sun-spot cycle length versus global average temperature (Hutton, 2009c; p.36, Fig. 12) show a near perfect correlation for 130 years until the 1980s. The global-warming faction point to this as evidence of the influence of atmospheric CO<sub>2</sub>, but now there is a strong suspicion that it is not properly corrected for the urban heat island effect. The suspicion is strongly reinforced by Dr. Jones' refusal to release the data. Source: <http://hadobs.metoffice.com/hadcrut3/diagnostics/global/nh+sh/>.

fund, a carbon-offset business, a renewable-energy investment business, and other global-warming-related ventures according to Lawrence Solomon (National Post, 2009). Gore's objective is to make fossil fuels uncompetitive by convincing governments to punishingly tax fossil fuel technologies through the mechanisms of CT and CCS. Meantime, Gore and his fellow vultures will make money at every stage of this

transformation. This is no time to be taken in with naive altruistic ideas about saving the planet because the plan is to enrich themselves on the average taxpayer's dollar.

Perhaps the most astonishing feature of the Global Warming Hysteria is the fact that the huge ball of energy in space, which supports the life and energy of the planet, has been reduced to a bit player behind a trace gas



whose volume is recorded in parts per million. (Hutton, 2009b) The Sun has, without question, been the driver of the Earth's climate for the last four billion years and, if there are any doubts in this regard, the Sun is demonstrating conclusively its dominant role in climate. It is now in a quiescent state not seen in the last 300 years. We have reported in *Climate Change v: Here Comes the Sun* (Hutton, 2009c), the role of the eleven-year sun-spot cycle and its correlation with climate. In Figure 10.2 (page 53) the Sun spot cycles for the last 400 years are reproduced. The correlation with climate is compelling: the quiescent periods of the Sun in the Maunder and Dalton Minima during the Little Ice Age; the obvious increase in activity in the last part of the 20th Century. Even the subtle cooling from the late Forties to the mid-1970s can be observed in the Sun spot cycles (Figure 10.3, page 53). This 30-year cooling period is not indicated by atmospheric CO<sub>2</sub> nor is the cooling we are experiencing now in conjunction with the Sun's quiescence. The Sun is currently at 723 Sun-spot-free days and counting. It can be seen in Figure 10.4 that this Sun-spot minimum accounts for three of the record low years for the 20th and 21st Centuries. Sunspot cycle 23 now most resembles cycle 3 in 1790, immediately preceding the Dalton Minimum from 1790-1835 (Figure 10.2, page 55) near the end of the Little Ice Age, 1350-1850. The Dalton Minimum coincided with a period of very cold winters. Historical records show that early settlers successfully crossed the Mississippi River at St. Genevieve, 200 miles south of St. Louis in 1799. The ice thickness was determined to be two feet, sufficient to support the heavily loaded wagon train. The River Thames froze regularly as did the Hudson River, enabling people to walk across the ice from Manhattan to Staten Island. The British rolled heavy canons across the Hudson while the ice remained solid for five weeks. Later in 1821, taverns were constructed in the middle of the Hudson to provide refreshment and warmth to pedestrians.

The purpose of these articles is to provide access to objective scientific information on Climate Change, free of the fear-mongering and spin prevalent in the media and promoted by the environmental activists. The radical green movement has almost reached the point of a neo-religious urban movement and they have become immune to rational discourse on climate change. The level of sophistication is that we are putting all this rotten stuff into the atmosphere and it must be bad for the planet. The contrast between a molecule that stimulates life and growth and stuff that makes you sick (pollution) escapes them. The media, of course, promotes the idea that climate should be

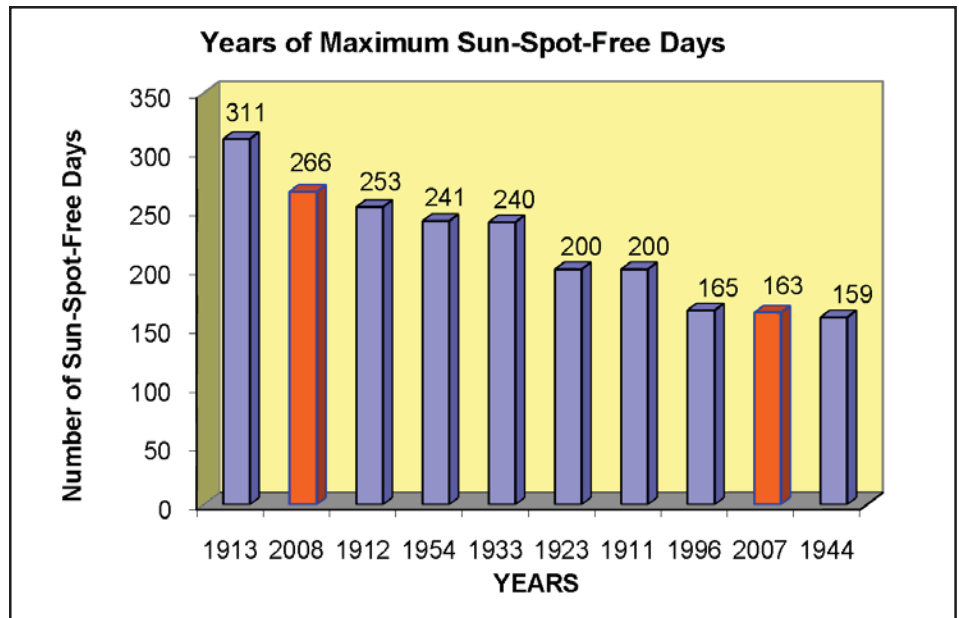


Figure 4. The diagram illustrates the remarkable behaviour of Sun Spot Cycle 23, which now has recorded three years among the record ten low sun-spot years since the start of the 20th Century. The years 2007 (163 days), 2008 (266 days), and 2009 (212 days and counting) give a grand total since the minima started of 723 days. The average number of Sun-spot-free days for the last part of the 20th Century is 345 days and the general average is 485 days.

stable so that any unusual events can be attributed to global warming. Climate, however, is continuously variable just as we experience weather. In this environment, attempts to introduce data and logic have been treated with anger and hostility. It is common then to introduce an ad hominem attack on the integrity of the individual as a lackey of the oil or coal companies, and attach pejorative terms such as deniers, or skeptics, thereby avoiding having to actually address the scientific point. As more critical evidence comes to light then grimmer and grimmer climate scenarios are posited, even where there is well documented contrary scientific evidence. If the lie is repeated often enough it becomes truth in the public mind. We hope, therefore, that readers of these articles may find the energy and enthusiasm to spread the word to their friends, families, neighbours, and government representatives. This is in order that we may be spared the incredibly misguided policies currently being contemplated. Be clear they are totally misguided taxes, which are liable to triple the cost of fuel and energy with unfathomable effects on the economy, while assuredly having no effect whatsoever on climate.

Let me here close with a quotation from Ian Plimer's excellent book, *Heaven and Earth*: "We live in a time when the methodology of science is suspended. Reactions to human-induced global warming based on incomplete science can only be extraordinarily costly, will distort energy policy, and will make the poor poorer...in

the case of the effect of CO<sub>2</sub> on climate, the correct solution to the non-problem of CO<sub>2</sub> is to have the courage to thoughtfully do nothing."

#### REFERENCES

- Carlin, Alan. 2009. *Comments on Draft Technical Support Document for Endangerment Analysis for Greenhouse Gas Emissions under the Clean Air Act*. [http://cei.org/cei\\_files/fin/active/10/DOC065209](http://cei.org/cei_files/fin/active/10/DOC065209).
- Dyson, Freeman J. 2005. *Winter Commencement Address*. University of Michigan. University of Michigan News Service. [www.umich.edu/news/index.html?DysonWinCom05](http://www.umich.edu/news/index.html?DysonWinCom05).
- Hutton, A. Neil. 2009a. *Climate Change II: The World's Historic Climate*. *Canadian Society of Petroleum Geologists, The Reservoir*, v. 36, issue 2, p. 31-35.
- Hutton, A. Neil. 2009b. *Climate Change III: Carbon Dioxide*. *Canadian Society of Petroleum Geologists, The Reservoir*, v. 36, issue 3, p. 38-43.
- Hutton, A. Neil. 2009c. *Climate Change V: Here Comes the Sun*. *Canadian Society of Petroleum Geologists, The Reservoir*, v. 36, issue 5, p. 31-39.
- Hutton, A. Neil. 2009d. *Climate Change VIII: Global Circulation Models*. *Canadian Society of Petroleum Geologists, The Reservoir*, v. 36, issue 8, p. 24-28.
- Lindzen, R. S. 1992. *Global Warming: The nature and origin of the alleged scientific consensus*. *Proceedings of the OPEC Seminar on the*

*Environment*, 13-15 April 1992.

Lorenz, Edward M. 1979. Does the Flap of a Butterfly's Wings in Brazil Set off a Tornado in Texas. American Association for the Advancement of Science, Annual Meeting. Dec. 29th 1979.

McIntyre Steve. 2007. Hansen then and Now, Climate Audit. [www.climateaudit.org/?p=1175](http://www.climateaudit.org/?p=1175).

Orlowski, Andrew. 2009. Global Warming Ate My Data, We lost the numbers: CRU responds to Freedom of Information Requests. [http://www.theregister.co.uk/2009/08/13/cru\\_missing\\_data](http://www.theregister.co.uk/2009/08/13/cru_missing_data).

Orlowski, Andrew. 2009. Japanese Scientists have made a dramatic break with the UN and Western-backed hypothesis of Climate Change. The Register, 25th February. [http://www.theregister.co.uk/2009/02/25/jstor\\_climate\\_report\\_translation/](http://www.theregister.co.uk/2009/02/25/jstor_climate_report_translation/).

Plimer, Ian. 2009. HEAVEN AND EARTH, global warming, the missing science. First published, Australia by Connor Court Publishing Pty. Ltd., Ballan Victoria. Also by Taylor Trade Publishing, Rowman and Littlefield Publishing Group Inc. Lanham Maryland 20706.

Solomon, Laurence. 2009. Carbon Baron Gore, Climate Profiteers. National Post, Wednesday, August 26, 2009.

Tennekes, Hendrik. 1986. No Forecast is Complete without a Forecast of Forecast Skill. European Centre for Medium Range Weather Forecasts [www.sepp.org/Archive/NewSEPP/Climate%20models-Tennekes.htm](http://www.sepp.org/Archive/NewSEPP/Climate%20models-Tennekes.htm).

Tennekes, Hendrik. 1992. Karl Popper and accountability of Numerical Weather Forecasting. *Weather* v. 47 p. 343-346. <http://climate.science.org/files/Popper.pdf>.

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