Knock, Knock: Where is the Evidence for Dangerous Human-Caused Global Warming?

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'The new religion of global warming …. is a great story, and a phenomenal best seller. It contains a grain of truth and a mountain of nonsense. And that nonsense could be very damaging indeed. We appear to have entered a new age of unreason, which threatens to be as economically harmful as it is profoundly disquieting. It is from this, above all, that we really do need to save the planet'.

Nigel Lawson, p. 106, 'An Appeal to Reason: A Cool Look at Global Warming', 2008.

I. INTRODUCTION

Before human-caused global warming[2] can become an economic problem, it first has to be identified by scientific study as a dangerous hazard for the planet, distinct from natural climate change.

This notwithstanding, a number of distinguished economists have recently written compendious papers or reports on the issue, for example Nicholas Stern (2006) and William Nordhaus (2007); in Australia, Ross Garnaut[3] is currently undertaking a similar analysis. These persons, and many other public commentators and politicians as well, have indicated that they accept that there is a scientific consensus that dangerous, human-caused global warming is occurring, as set by the views and advice of the Intergovernmental Panel on Climate Change (IPCC).

The IPCC is the United Nations body whose second chairman, John Houghton, wrote in 1994 that '*unless we announce disasters, no one will listen*'. From that point forward, it was obvious that IPCC pronouncements needed to be subjected to independent critical analysis;

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2 The term 'global warming', as popularly used, is shorthand for the cumbersome phrase 'dangerous global warming caused by human carbon dioxide emissions'. For brevity and readability, I will sometimes adopt that usage in this paper. Similarly, many people use 'climate change' as a synonym for 'global warming', with the same implicit definition of dangerous human causation. I will prefer to use 'climate change' in its native, self-evident meaning, adding the qualifiers 'human-caused' or 'natural' where necessary.

3 http://www.garnautreview.org.au/domino/Web_Notes/Garnaut/garnautweb.nsf

in fact, the opposite has happened, and increasingly the world's press and politicians have come to treat IPCC utterances as if they were scribed in stone by Moses. This is a reflection, first, of superb marketing by the IPCC and its supporting cast of influential environmental and scientific organisations; second, of strong media bias towards alarmist news stories in general, and global warming political correctness in particular; and, third, of a lack of legislators and senior bureaucrats possessed of a sound knowledge of even elementary science, coupled with a similar lack of science appreciation throughout the wider electorate – our societies thereby becoming vulnerable to what can be termed 'frisbee science', i.e. spin.

Having decided around the turn of the 20th century that 'the science was settled', for the IPCC said so, politicians in industrialized societies and their economic advisors started to implement policies that they assured the public would 'stop global warming', notably measures to inhibit the emission of the mild greenhouse gas carbon dioxide into the atmosphere. However, the acronym GIGO (garbage in, garbage out) that has long been applied to computer modelling endeavours applies also to economic studies that purport to give policy advice against the threat of future climate change. For the reality is that no-one can predict the specific way in which climate will change in the future, beyond the general statement that multi-decadal warming and cooling trends, and abrupt climatic changes, are all certain to continue to occur. It is also the case that the science advice of the IPCC is politically cast, and thereby fundamentally flawed to a degree that makes it unsuitable for use in detailed economic forecasting and policy creation. This is why Stern's work, for example, has been able to be so severely criticized on both scientific and economic grounds (Carter et al. 2007; Tol 2006).

Richard Lindzen of MIT famously remarked of global warming alarmism a few years ago that '*The consensus was reached before the research had even begun*'. Another distinguished natural scientist, the late Sir Charles Fleming from New Zealand, made a similarly prescient statement when he observed in 1986 that '*Any body of scientists that adopts pressure group tactics is endangering its status as the guardian of principles of scientific philosophy that are worth conserving'*. These quotations are apposite, because pressure-group tactics in pursuit of a falsely claimed consensus have become the characteristic *modus operandi* of the IPCC-led global warming alarmism that now surrounds us at every turn.

This is an economics journal, and as a scientist I am clearly not the appropriate person to discuss the economics of the global warming issue were there any need to do so. But I have argued above that sound science understanding is an essential prerequisite to any meaningful economic analysis, and that we have not yet attained such an understanding, least of all as represented by IPCC advice. Therefore, the best service that I can render to readers is to alert them to the danger of wasting their time and talent – as many economists already have – in erecting rigorous economic models on the basis of fanciful or voodoo climate science. My paper will concentrate, then, not on economics but on presenting a critical account of the scientific arguments that have been claimed as evidence for dangerous, human-caused global warming.

II. CONTEXT: CLIMATE HAS ALWAYS CHANGED, AND ALWAYS WILL

The issue of dangerous human-caused global warming is a complex one. It can be assessed meaningfully only against our knowledge of natural climate change, which is incomplete and in some regards even rudimentary.

There is no Theory of Climate, in the sense that there is a Theory of Gravitation or Relativity. Therefore no computer model, let alone the unvalidated General Circulation Models (GCMs) that are employed, for example, by the IPCC, can accurately predict future global or regional climate. Furthermore, science does not operate by consensus. To assert – as many do – that IPCC advice on climate change represents a consensus scientific view that should necessarily be acted upon is a statement about sociology and politics, not about science.

These points being understood, and as outlined below, study of the geological record of climate reveals many instances of natural changes of a speed and magnitude that would be hazardous to human life and economic well being should they be revisited upon our planet today. Many of these changes are unpredictable, even in hindsight. That such natural changes will occur again in the future, both coolings and warmings, is certain.

It is therefore indeed true that future climate change is an important subject that requires to be approached via appropriate public policy-making.

Unfortunately, current policy approaches have been formulated from a combustible combination of poor science, special-interest-group pleading and public hysteria, which together distract from, rather than deal with, the very real risks of natural climate change. Indeed, the risks of natural change are almost entirely ignored by the IPCC and by the politicians, press and public who participate in the current climate 'debate'.

1. The Geological Setting of Climate Change

The focus of IPCC activity has been on comparing contemporary climate change with that of the last 150 years of instrumented temperature records, sometimes extending back to around 1,000 years using proxy measurements such as tree ring analysis. This is a ridiculously short and atypical period over which to seek to understand climate change.

Using climate records that represent the last several million years, palaeoclimatologists and palaeoceanographers have established a sound understanding of the natural patterns and some of the mechanisms of climate change. The most important evidence comes from sediment cores from beneath the deep seafloor and ice cores through the Greenland and Antarctic ice caps. Any one such core does not, of course, depict global climate; however, suitable cores yield climate data that are representative of a wide region and some may even approximate a global pattern.

Generally agreed inferences from these data are as follows.

- Between about 6 and 3.5 million years ago, during the period that geologists term the Pliocene, small warm-cold climatic oscillations occurred around a mean temperature that was 2-3^0 C warmer than today (*Figure 1*). After 3.5 million years ago, global temperature embarked on a steady decline, at the same time that the background 40 ky-long climatic cycles became accentuated into more severe glacial-interglacial oscillations.

- Since about 0.6 million years ago, each larger glacial-interglacial oscillation has occurred on a longer, 100 ky-long periodicity. For more than 90% of this time the earth's mean temperature was cooler, and often much cooler (up to ~6°C), than today (*Figure 2*). Warm interglacial periods comprised less than 10% of the time, and on average lasted only ~10 ky. Civilisation and our modern society developed during the most recent warm interglacial period (the Holocene), which has already lasted 10 ky. In many places, temperatures earlier in the Holocene – during a period that was formerly referred to as the climatic optimum – were up 1-2°C warmer than today.
- During the Holocene, a 1,500 yr-long climate cycle of 1-2°C magnitude, and probably of solar origin (Avery and Singer 2008), was conspicuous. In Greenland, the three most recent historic warm peaks of this cycle (Minoan, Roman and Mediaeval Warm Periods) all attained or exceeded the magnitude of the late 20th century warming (*Figure 3*). A variety of detailed proxies from around the world can be used to construct a global temperature estimate for the last 1,500 years that confirms the greater warmth of the Mediaeval over the Late 20th Century Warm Period (*Figure 4*) (Loehle and McCulloch 2008).
- The climate record is punctuated, too, by episodes of abrupt climate change, when climate changed across almost the full glacial-interglacial range in a period as short as a few years to a few decades. The causes of such abrupt climate change remain largely unknown.
- Glacial ice cores have the unique capability of yielding measurements of ancient atmospheric chemistry from air samples that are captured as bubbles within the ice. It transpires that inferred changes in past temperature and atmospheric carbon dioxide concentration in such cores occur in close parallelism. In detail, however, the changes in temperature precede their parallel changes in carbon dioxide by between ~800 and 2000 years (Mudelsee 2001). Thus carbon dioxide cannot be the primary forcing agent for temperature change at the glacial-interglacial scale.

Compared with the ancient climate record, temperatures during the late 20th Century were neither particularly high nor particularly fast-changing. For example, temperatures in Antarctica for the three interglacial periods that preceded the Holocene were up to 5°C warmer than today (*Figure 2*), and temperatures ~2-3°C warmer probably characterised much of the planet during the Pliocene (*Figure 1*).

It is clear from these various facts, therefore, that a warmer planet than today's is far from unusual. It is also clear that climate changes naturally all the time. The idea that is implicit in much public discussion of the global warming issue – that climate was stable (or constant) prior to the industrial revolution, after which human emissions have rendered it unstable – is simply fanciful. Change is what climate does.

2. The Human Influence on Climate Change, in Natural Context

Despite the great variability and high magnitudes of natural climate change, it is clearly also the case that human activities have a measurable effect on local climates.

For example, the concrete, glass, steel and macadam that are used to build a connurbation absorb more radiant heat from the sun during the day than did the pre-existing natural vegetation. The result is a local warming called the urban heat island effect which, for a large city, has a magnitude of several degrees (McKitrick and Michaels 2007). Alternatively, when humans clear forested areas, the pasture or crops that are planted are often lighter in colour than was the forest. This results in reflection of more of the incoming solar energy than before, and hence cooling. So humans, through changed land usage, have an effect on local climate that is variously warming or cooling (Steyaert and Knox 2008). Summing these local signals all over the globe, it follows that humans must exercise an effect on global climate also.

The question in context, therefore, is not 'do humans have an effect on global climate', but rather 'what is the sign and magnitude of the net global human effect on climate, and can it be measured'. Remarkably, given the expenditure and effort spent looking for it since 1990, no summed human effect on global temperature has ever been identified or measured. Therefore, the human signal most probably lies buried in the variability and noise of the natural climate system. This is so to a degree that as a statement of fact we cannot even be certain whether the net human signal is one of warming or cooling[4]. Though it is true that many scientists anticipate on theoretical grounds that net warming is the more likely, no strong evidence exists that any such warming would *ipso facto* be dangerous.

III. WHAT ABOUT THE ALLEGEDLY DANGEROUS 20TH CENTURY WARMING?

The instrumental record of climate change:
150 years of thermometer data = 5 climate data points
50 years of radiosonde data =2 climate data points
29 years of satellite data = 1 climate data point

Mark Twain reputedly once remarked '*Climate is what you expect; weather is what you get*'. Though it is hard to improve on such a pithy aphorism, scientists prefer to use definitions that are quantitatively based. Accordingly, since the early 20th century it has been agreed amongst climatologists that 'climate' is taken to be represented at a particular site by an averaged 30-yr-long span of meteorological data. It happens that historical temperature records made at ground thermometer stations worldwide, and that are viewed as 'reliable', extend back for about 150 years. Thus our longest instrumental dataset comprises just 5 climate data points, a point that is worth bearing in mind next time someone tries to convince you that we should revolutionize the energy systems of our industrial societies on account of dangerous human-caused global warming.

Despite it being more a weather than a climate record, a great deal of valuable information does of course reside in the instrumental dataset, especially with regard to helping us understand meteorological processes. The two main ground thermometer records, from the British

[4] Cooling: The Human Climate Signal? A Note from 'Cohenite': http://www.jennifermarohasy.com/blog/archives/003303.html

Meteorological Office[5] and NASA (Goddard Institute for Space Studies)[6], are similar and show an overall rise in temperature of a little less than 1°C since 1860, this warming in part representing recovery from the earlier Little Ice Age (*Figure 5*). Warming, however, did not proceed monotonically. Instead, and as for all extended climate records of adequate resolution, the thermometer data display a multi-decadal rhythmicity with alternating periods of warming and cooling. Within this record, it is the short phase of mild warming that started around 1980 and terminated in 1998 that so excites the IPCC and climate alarmists.

Despite its widespread use, the thermometer temperature dataset is far from perfect; for its earlier part is based on rather too few high quality station records, and its later part, since about 1980, is known to be contaminated by the urban heat island effect (McKitrick and Michaels 2008). A comparison between the thermometer dataset and two other independent and more accurate data sets is revealing. The first of these, collected using radiosonde sensors mounted on weather balloons, indicates a cooling between 1958 and 1975, followed by an equivalent warming to 2005, i.e. displays no significant overall warming between 1958 and 2005 (*Figure 6*). The second, collected since 1979, is compiled independently by Remote Sensing Systems (RSS) and the University of Alabama, Hentsville (UAH) from measurements made with microwave sensing units (MSU) mounted on orbiting satellites[7]. Both versions of the MSU data show the same phase of mild late 20th century warming that is exhibited by the thermometer and radiosonde records (*Figure 7*).

The gentle, short-term global warming that occurred in the late 20th century falls within previous natural rates and magnitudes of warming and cooling. It is therefore *prima facie* unalarming, especially when one remembers that the historic ground temperature records usually cited in support of the warming are warm-biased by the urban heat island effect. In comparison, the radiosonde record shows no significant warming between 1958 and 2005, and the 'warming trend' displayed by both the radiosonde and satellite temperature curves since 1979 can alternatively (and perhaps preferably) be represented as a single step increase of ~0.2^0 C across the 1998 El Nino (Gray 2006). However, irrespective of the way in which the 1979-1998 data are interpreted, it remains the case that the late 20th century phase of rising temperature terminated in 1998. No warming has occurred since 1998 (*Figs. 5, 8*) despite an increase in atmospheric carbon dioxide of about 15 ppm (5%).

IV. CARBON DIOXIDE, COMPUTER MODELS, AND ALL THAT JAZZ

1. Cutting Carbon Dioxide Emissions will cause no Measurable Difference to Future Climate

Public discussion about 'carbon policy' or 'reducing greenhouse gases' centres around the need to reduce human emissions of carbon dioxide. Yet even educated persons mostly have no comprehension that the overwhelmingly dominant greenhouse gas is water vapour; that, as

5 http://www.metoffice.gov.uk/research/hadleycentre/CR_data/Monthly/Hadplot_globe.gif

6 http://data.giss.nasa.gov/gistemp/

7 RSS – http://wattsupwiththat.wordpress.com/2008/02/04/rss-satellite-data-for-jan08-2nd-coldest-january-for-the-planet-in-15-years/; UAH – http://wattsupwiththat.wordpress.com/2008/02/06/uah-satellite-data-for-jan08-in-agreement-with-rss-data/

a minor greenhouse gas, carbon dioxide causes less than 4% of the warming produced by all atmospheric greenhouse gases[8]; and that human emissions represent just a tiny portion (~3%) of that 4%. What is presently missing from the public debate, then – and it is not provided by computer model outputs, either – is an appreciation of the small scale (in context) of human emissions.

Nonetheless, there is little dispute amongst scientists that atmospheric carbon dioxide levels have increased by about 30% over the 20th century and that human emissions are one of the main causes. Nor is there any disagreement that carbon dioxide is a greenhouse gas that exerts a small initial warming effect. But beyond this, there is no consensus at all as to the magnitude of the warming that will be exerted by increased carbon dioxide once all likely feedback loops are considered.

Relevant points include the following:

- A logarithmic relationship exists between the addition of carbon dioxide to the atmosphere and radiative heating, which causes each incremental amount of carbon dioxide to exert a lesser heating effect (Figure 9). Post-industrial increases in greenhouse gases, including the 100 ppm increase in carbon dioxide, are estimated to have already caused about 75% of an anticipated 1°C of human warming (Lindzen 2006), so that all that remains to occur for a doubling of carbon dioxide is additional warming of an insignificant few tenths of a degree.
- IPCC models, which invoke a positive feedback loop from water vapour, predict much greater increases up to 6.4°C for a doubling in carbon dioxide (IPCC, 2001, 2007). These calculations take numerical account of only positive feedback effects, especially that of increasing water vapour, and neglect negative feedback loops such as the generation of additional (reflective) low cloud cover. Alternative calculations by independent scientists suggest an increase of only 0.2-1.0°C for a doubling of carbon dioxide (Isdo 2001).
- Carbon dioxide has previously reached concentrations similar to today's industrially enhanced levels, a few thousand years ago, in the early Holocene (Kouwenberg, Wagner, Kurschner, and Visscher 2005). Prior to that, in earlier geological epochs, atmospheric carbon dioxide attained levels of 1000 ppm or more without known untoward environmental effects (Haworth 2005).

These considerations indicate that only minor warming will result from further increases in atmospheric carbon dioxide above the assumed pre-industrial level of about 280 ppm. It follows that cutting carbon dioxide emissions, be it in Australia or worldwide, is unlikely to cause any measurable change in future climate. Neither does any case exist for the assumption that higher levels of carbon dioxide are, *ipso facto*, harmful. First, because any mild warming caused by enhanced carbon dioxide is likely to be of net climatic benefit; and, second, because higher atmospheric carbon dioxide both enhances plant growth and aids efficiency of water use (Eamus 1996). In reality, enhanced atmospheric carbon dioxide is a net benefit for biodiversity, food production and greening of the planet (Wittwer 1992).

8 http://www.geocraft.com/WVFossils/greenhouse_data.html

2. Computer Models are not Evidence

The IPCC's assertion that a dangerous human influence is being exerted on climate change rested in 2001 on three main arguments. These were (i) that the thermometer-based ground-temperature record shows unprecedented warming; (ii) the claim, after the Mann et al. (1998) 'hockey stick' model of climate change, that late 20th century temperatures rose to an unnatural level and at an unnatural rate; and (iii) the implication, based on a radiative-balance model of atmospheric processes, that deterministic computer models can predict climate 50 or 100 years ahead. Regarding (i), the ground temperature curve now shows no statistically significant warming since 1995, and cooling since 2002 (*Figures. 5, 8*). Regarding (ii), the work of Mann et al. has been shown to be deeply statistically flawed (McIntyre and McKitrick 2003). Which leaves GCM computer models as the sole remaining argument for dangerous human-caused warming. 'How are they travelling', you ask? 'Not at all well' is the answer.

To begin with, none of the IPCC GCM models has been successful in forecasting the temperature record that actually elapsed between 1990 and 2007; all predicted the occurrence of monotonic warming, whereas what happened was that a rising temperature cycle peaked in 1998 and declined thereafter. Projection of the current cooling trend indicates that global temperature is now tracking outside the low estimate bounds of the IPCC ensemble of model projections (*Figure 10*) (Liljegren 2008). This IPCC forecast failure is scarcely surprising, because the cyclicity represented in the real world data is probably both solar-forced and related to climatic phenomena such as the North Atlantic Oscillation (NAO) and Pacific Decadal Oscillation (PDO); until recently (Keenlyside, Latif, Jungclaus, Kornblueh, and Roeckner 2008) none of these effects were included in the current generation of GCMs.

Moving on to more detailed modelling defects, Wentz et al. (2007) have shown that the GCMs underestimate surface evaporation response with temperature by a factor of three, which is a particularly troublesome failure given the importance of water vapour as a greenhouse gas. Most recently of all, Koutsoyiannis et al. (2008) compared 18 years of predictions by global warming models against real-world rainfall and temperature from 8 geographically dispersed stations that each has a record over 100 years long. It transpires that the more recent 4AR (2007) models used by the IPCC are no better than older 3AR (2001) versions, and that overall the

> 'models perform poorly, even at a climatic (30-year) scale. Thus local model projections cannot be credible, whereas a common argument that models can perform better at larger spatial scales is unsupported'.

An important and more general point that is not appreciated at all by politicians, press and the general public is that, in any case, GCMs do not provide future climate predictions or forecasts. Rather, the models produce 'projections' – which have no demonstrated forecast skill and are merely selected outputs from among the innumerable alternative climate futures that might or might not eventuate. This has been well summarised by IPCC senior scientist and lead author, Kevin Trenberth (2007), who writes:

> 'There are no (climate) predictions by IPCC at all. And there never have been'. Instead, there are only 'what if' projections of future climate that correspond to certain emissions

> scenarios'. For 'none of the models used by IPCC is initialised to the observed state and none of the climate states in the models corresponds even remotely to the current observed climate'. GCMs 'do not consider many things like the recovery of the ozone layer, for instance, or observed trends in forcing agents' and 'the state of the oceans, sea ice and soil moisture has no relationship to the observed state at any recent time in any of the IPCC models. …. There is neither an El Nino sequence nor any Pacific Decadal Oscillation that replicates the recent past; yet these are critical modes of variability that affect Pacific rim countries and beyond . . . the starting climate state in several of the models may depart significantly from the real climate owing to model errors' and 'regional climate change is impossible to deal with properly unless the models are initialised'.

That deterministic GCMs are unable to predict future climate accurately, at both global and regional level, is not just a matter of Kevin Trenberth's opinion but is well understood by all climate modelling practitioners and their colleagues; starting with the IPCC authors who wrote in 3AR (Section 14.2.2.2, p. 774):

> 'In climate research and modelling, we should recognize that we are dealing with a coupled non-linear chaotic system, and therefore that long-term prediction of future climate states is not possible.'

Similarly, former director of the World Meteorological Organization, John Zillman (2003) wrote:

> 'The most important question – should global warming proceed as the IPCC reports suggest – is how will warming be manifest at the national, regional and local level, and what would that mean for each of us? I believe this question is, at present, completely unanswerable'.

And another senior IPCC representative, New Zealander Dr. Jim Renwick (2007), stated that:

> 'Climate prediction is hard, half of the variability in the climate system is not predictable, so we don't expect to do terrifically well'.

Dr Renwick was responding to an audit showing that the long term climate forecasts issued by NIWA were accurate only 48 per cent of the time. It is therefore not surprising that CSIRO, which provides one of the model outputs used by the IPCC, puts the following disclaimer on its climate modelling consultancy studies (e.g., Walsh et al., 2002):

> 'This report relates to climate change scenarios based on computer modelling. Models involve simplifications of the real processes that are not fully understood. Accordingly, no responsibility will be accepted by CSIRO or the QLD government for the accuracy of forecasts or predictions inferred from this report or for any person's interpretations, deductions, conclusions or actions in reliance on this report.'

From this discussion, it is clear that deterministic GCMs do not produce predictive outputs that are suitable for direct application in policy making; it is therefore inappropriate to use IPCC projections for planning, or even precautionary, purposes as if they were real forecasts

of future climate. Notwithstanding, it remains the case, amazingly, that IPCC's claims of a dangerous human influence on climate now rest almost solely on their unrealistic, unvalidated GCM climate projections.

3. Circumstantial Evidence for Climate Change, and the Null Hypothesis

It has mostly escaped public commentators on climate change, such as Mr Al Gore, that Earth is a dynamic planet. Earth's systems are constantly changing, and its lithosphere, biosphere, atmosphere and oceans incorporate many complex, homoeostatic, buffering mechanisms. Changes occur in all aspects of local climate, all the time and all over the world. Geological records show that climate also changes continually through deep time. Change is what climate does, and the ecologies of the natural world change concomitantly, in response.

Which is why, so far, I have made little mention of the bulk of the climate alarmist material that now fills out our daily newspapers and news bulletins, and which asserts that many and varied aspects of earth's natural system are being destablilised by human-caused climate change. We will all be rooned, they say, as will the polar bears and armadillos, by melting ice, rising sea-level, more or more intense storms, more or more intense droughts, more or more intense floods, more or less precipitation, more atmospheric aerosols, more mosquito bites, more deaths from heat stroke or even – as I read in an apparently straight-faced newspaper report the other day – the collapse of our sewage systems from additional and excessive rainfall runoff.

Which brings us to the matter of the null hypothesis. Given the great natural variability exhibited by climate records, and the failure to date to compartmentalize or identify a human signal within them, the proper null hypothesis is that global climate changes are presumed to be natural unless and until specific evidence is forthcoming for human causation. In complete contrast to this, the writings of IPCC supporters frequently imply an inverted null hypothesis, whereby any observed global warming is presumed to be human-caused unless it can be shown otherwise. But because both the rate and the magnitude of recent warmings fall within the bounds of previous natural climate variation, the onus of proof of a human causation for change lies with those who would assert it.

It is, of course, the case that many of these environmental change topics are matters for proper concern. Some of them may well occur in response to local or global climate change, and all are now subject to research investigation. But as evidence for *human-caused* global climate change, such lines of reasoning are entirely circumstantial. It has been estimated that the industrialized nations currently spend more than US$5 billion a year on climate change research, with a cumulative spend since 1990 that must approach $100 billion. Despite the expenditure of such a sum, and great research effort by IPCC-related scientists, to date no empirical study has established a certain link between changes in any of the phenomena listed above and human-caused global warming.

In summary, for the planetary environmental changes that have been documented to date the null hypothesis that they have a natural origin remains unfalsified.

V. SCIENCE IS NOT ABOUT CONSENSUS, NOR AUTHORITY

The approach taken earlier in this paper has been to explain some of the science issues of global warming in a way that encourages readers to consult relevant sources and make their own assessment. This is, of course, the traditional scientific method, which relies on empirical data, established laws and simple logic, and pays no attention to consensus or authority.

In contrast, most of today's public commentators on global warming stress the *authority* of the climate pronouncements made by the IPCC and its supporting organisations. Often added too is the vacuous claim that a 'consensus' of scientists agree with the IPCC views, as if that were scientifically relevant. At the same time, unsolicited *ad hominem* attacks are made on qualified persons who espouse different views, and who are often disparaged as 'sceptics', 'deniers', or worse.

In reality, and despite a widespread lack of public understanding of the fact, the IPCC is not a scientific but a political body, albeit advised by scientists. This matter, and the scientific inadequacies of some of the IPCC's publications, necessitate further explanation.

1. The Inadequacy of the IPCC

The IPCC is constituted under the United Nation's Framework Convention on Climate Change (FCCC), which, Humpty-Dumpty like, defines climate change as '*a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods*'. Thus at its point of origin and reporting, the IPCC is set up to consider not climate change in general, but only change caused by human perturbation of the atmosphere. This is an unbalanced brief that predictably and inevitably leads to unbalanced advice.

Starting in 1990, the IPCC has now provided four comprehensive Assessment Reports (1AR to 4AR). These reports provide a detailed treatment of many aspects of climate science as was reflected in the refereed scientific literature at the time of their publication. However, each successive science report has incrementally talked up the threat of dangerous human-caused change, especially in the influential Summaries for Policymakers (Carter 2007). Following IPCC intention, the SPM is the primary reference used by politicians and bureaucrats; it is a political document which, before release, is approved line by line by government appointed functionaries. Though based upon recommendations from qualified scientists, and resting in large part on its companion science review volume, the SPM carries a heavy political overlay.

Severe and mostly unrebutted criticisms have been made of the processes and procedures used by the IPCC in preparation of its Assessment Reports. The criticisms (McLean 2007a) include:

- that the IPCC operates a flawed 'peer review' process which differs from the conventionally understood meaning of the term, and is dismissive of any criticism of the ruling IPCC presumption of dangerous human influence on global climate;
- in the final stage of review of a Summary for Policymakers, changes have sometimes been incorporated at the behest of government bureaucrats without recourse to expert scientific assessment;

- there is repetitious promulgation of misleading IPCC participant statistics; for example, it is claimed that 'more than 2000 scientists' have participated in or approved the IPCC's 4AR recommendations; in fact, just 51 persons participated in the final approval of the SPM for the 4AR science volume; and McLean (2008) reports that out of the 62 expert reviewers of the critical Chapter 9, 'Understanding and Attributing Climate Change', 55 had a conflicting or vested interest, leaving only 7 reviewers who can be viewed, *prima facie,* as impartial. Seven, of course, is a very different number from 'more than 2000'.
- meritorious scientists participating in IPCC activities have expressed their dissatisfaction at what they perceive as political interference in the preparation of IPCC reports. For example, Dr Chris Landsea (2005), an acknowledged leading expert on hurricanes/cyclones, withdrew his participation in IPCC in 2005 with the comment that:

  > 'I personally cannot in good faith continue to contribute to a process that I view as both being motivated by pre-conceived agendas and being scientifically unsound'.

- in order to develop projections of future climate change, in 3AR the IPCC developed a number of alternative socio-economic scenarios for future world energy use; these scenarios, which feed into all climate projections made by the IPCC, have been shown to be both unrealistic and flawed (Castles and Henderson 2003), yet they have been adopted unchanged for the climate projections made in the recent 4AR.
- the IPCC uses a qualititative scale of probability terms that has no rigorous basis; terms such as 'likely (>66% probable)' and 'very likely (>90% probable)' have no actual statistical meaning but instead represent only considered opinions; such terminology is highly misleading, and represents sociology not science.

Noting these and other deficiencies, in 2006 an authoritative UK House of Lords Committee (2005) concluded that:

> 'We can see no justification for an IPCC procedure which strikes us as opening the way for climate science and economics to be determined, at least in part, by political requirements rather than by evidence. Sound science cannot emerge from an unsound process'.

2. Alternative Viewpoints to Those of the IPCC

At the same time that the public is unaware of the flawed nature of IPCC reports, it is also unaware that large numbers of highly qualified, independent scientists have repeatedly expressed non-alarmist views on global warming that run completely counter to the IPCC's advice (e.g., Non-intergovernmental Panel on Climate Change 2008).

For example, in December, 2007, 103 professional persons wrote a letter to the Secretary General of the United Nations that indicated, contrary to the impression left by the IPCC, that:

> 'Recent observations of phenomena such as glacial retreats, sea-level rise and the migration of temperature-sensitive species are not evidence for abnormal climate change, for none of these changes has been shown to lie outside the bounds of known natural variability.'
>
> 'The average rate of warming of $0.1^{-0}.20$ C/decade recorded by satellites during the late 20th century falls within known natural rates of warming and cooling over the last 10,000 years.'
>
> 'Leading scientists, including some senior IPCC representatives, acknowledge that today's computer models cannot predict climate. Consistent with this, and despite computer projections of temperature rises, there has been no net global warming since 1998. That the current temperature plateau follows a late 20th century period of warming is consistent with the continuation today of natural multi-decadal or millennial climate cycling.'[9]

The distinguished list of signatories to this letter included many winners of awards, medals and prizes in meteorology, climatology or cognate subdisciplines, and 24 are Emeritus Professors.

A recent public statement on climate change, the Manhattan Declaration, was first declared at a Climate Change meeting in New York in March, 2008[10], and concluded:

> 'That current plans to restrict anthropogenic CO2 emissions are a dangerous misallocation of intellectual capital and resources that should be dedicated to solving humanity's real and serious problems.'
>
> 'That there is no convincing evidence that CO2 emissions from modern industrial activity has in the past, is now, or will in the future cause catastrophic climate change.'
>
> 'That attempts by governments to inflict taxes and costly regulations on industry and individual citizens with the aim of reducing emissions of CO2 will pointlessly curtail the prosperity of the West and progress of developing nations without affecting climate.'

This Declaration has now attracted more than 1,100 signatories, of whom 187 (at the time of writing) are persons highly qualified in climate or a cognate science. A similar message was expressed in a letter to the UN by 103 professional persons.

Scientists associated with the United Nations Intergovernmental Panel on Climate Change appear to be bound by a 'cabinet solidarity' principle to the politically nuanced advice that is contained in IPCC's SPM. In contrast, the signatories of the UN letter and Manhattan Declaration, like the authors of the scientific papers that I refer to throughout this essay, provide their judgements independent of anything other than scientific consideration. Their prosaic, non-alarmist conclusions about climate change are, or course, of little value in helping media organizations sell advertising or build public influence, which is presumably why they are largely ignored by the press.

Science truth is not determined by head counts. Nonetheless, there is now overwhelming documented evidence that a large number of responsible, highly qualified professional scientists

9 http://www.nationalpost.com/news/story.html?id=164002 and http://www.nationalpost.com/news/story.html?id=164004

10 http://www.climatescienceinternational.org/index.php?option=com_content&task=view&id=78&Itemid=1

and economists do not accept that the advice given by the IPCC is accurate or wise enough to be relied upon for setting climate policies. The considered views of such a large body of expert people cannot simply be wished away.

VI. DISCUSSION

Independent scientists who have considered the matter carefully do not deny that human activities can have an effect on local climate, nor that the sum of such local effects represents a hypothetical global signal. The key questions to be answered, however, are, first, can any human global signal be measured, and, second, if so does it represent, or is it likely to become, dangerous change outside of the range of natural variability?

The answer to these questions is that no human global climate signal has yet been measured, and it is therefore likely that any such signal lies embedded within the variability of the natural climate system. Meanwhile, global temperature change is occurring, as it always naturally does, and a phase of cooling has succeeded the mild late 20th century warming.

Ironically, though the late 20th century warming was manifestly not dangerous, the current cooling may yet prove to be because of mounting evidence of solar causation. A relationship exists between the length of the sunspot cycle and the annual average temperature (Friis-Christensen and Lassen 1991). Currently, the sun remains in the quiet phase at the end of solar cycle 23, which is already more than 2 years longer than the average 10.7 year cycle length; one estimate is that as the quiet period continues to extend, there will be 1.4 thousandths of a degree/day of incremental cooling (Archibald 2007). Accordingly, some solar physicists are now warning that continuation of the quiet phase may result in an extended cooling (Clilverd, Clarke, Ulrich, Rishbeth, and Jarvis 2006; Schatten and Pesnell 2007), perhaps even as intense as the damaging Dalton (1780-1830) minimum that marked the last part of the Little Ice Age.

In addition to the fact that the earth is now cooling, the specific hypothesis that dangerous global warming will be caused by human carbon dioxide emissions has itself been thoroughly explored and tested over the last 20 years. The hypothesis has failed all tests to which it has been subjected, and despite great research effort and financial expenditure no convincing or strong countermanding evidence has emerged that suggests it to be true. Little that is predicted by the dangerous, human-caused global warming hypothesis has yet been observed in empirical data.

1. Emissions Trading Legislation

These scientific truths notwithstanding, there is presently animated public discussion about introduction of carbon dioxide emissions trading legislation in both Australia and New Zealand in order to 'stop global warming'. This planned policy development is underpinned by a political conviction that flies in the face of science reality, and is now maintained by a highly diverse and very strong group of special interests. The self-interest groups include politicians, bureaucrats, scientists, environmental lobby groups, other priests, energy companies, other big businesses, financial marketeers and the media.

The 2008 global food crisis is an example of previous well-intentioned environmental policy relating to climate change that went sadly wrong. The disastrous results of the idea of putting

corn in your petrol tank have included an increase in grocery bills in most western nations, food rationing in parts of the USA, and food riots, starvation and an accelerated cutting down of native rainforests in third world countries. These results were, of course, unintended, but they most certainly were not unanticipated. It's simply that those who predicted the negative effects of the biodiesel craze were not listened to, their voices lost against the clamour of shrill environmental hysteria. A famous earlier example of the same phenomenon was the world ban on DDT use, which was similarly based upon false environmental scaremongering. Thankfully, the DDT ban was recently lifted by the UN, but not before it had resulted in many millions of unnecessary deaths in underdeveloped countries (Reiter 2007).

These earlier examples of tragically miscarried policy epitomize the pitfalls of listening to the siren song of the great ecosalvationist scare of our age – that of dangerous human-caused global warming. The economic and social effects of schemes like biofuel subsidy and emissions trading are costly, and above all regressive. That is, they will hurt most the underprivileged in all societies. Given that schemes like these are unlikely to exert any measurable influence on future climate, such policies can only be adjudged as immoral.

2. The Precautionary Principle

This principle was introduced in order to assist governments and peoples with risk analysis of environmental issues. First formulated at a United Nations environment conference at Rio de Janiero in 1992, it stated that 'Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation'. Faced with a lack of compelling science on their side, many global warming activists invoke the precautionary principle as a means of forcing action against what they feel, but cannot show, is a dangerous risk of human-caused warming.

Despite a disturbing lack of intellectual rigor, not to mention the presence of ambiguity in the original and other definitions, the precautionary principle has been incorporated into law in several countries. For instance, in Australia, the Commonwealth Fisheries Management Act 1991 (Section 516A) requires the regulatory authority

> 'to pursue the objective of ensuring that the exploitation of fisheries resources and the carrying on of any related activities are conducted in a manner consistent with the principles of ecologically sustainable development and the exercise of the precautionary principle'.

Experience shows, too, that the adoption of the precautionary principle as even a policy guideline is inevitably followed later by the development of legally binding precautionary rules (Marchant and Mossman 2005).

A comprehensive analysis by the Science and Technology Committee of the U.K. House of Commons (House of Commons Science and Technology Committee 2006) recently came to the conclusion that:

> 'we can confirm our initial view that the term 'precautionary principle' should not be used, and recommend that it cease to be included in policy guidance'. The committee added that 'In our view, the terms 'precautionary principle' and 'precautionary approach' in isolation from any such clarification have been the subject of such confusion and different interpretations as to be devalued and of little practical help, particularly in public debate'.

In the face of such advice, those who nonetheless wish to apply the precautionary principle to near-future climate change need to reflect on the strong likelihood that significant, and perhaps damaging, global cooling is the most likely eventuality over the next few decades.

Any such cooling will have a strong negative impact on the major mid-latitude grain-producing areas of the northern hemisphere. In such circumstances, the precautionary thing to do would be to increase the amount of carbon dioxide in the atmosphere, both for its mild warming and for its plant fertilization effect. At the same time, given its value as a non-renewable energy source, it would also be a sensible precaution not to squander the extra 30-40% of coal that is required to sequester the carbon dioxide that is emitted by coal-fired power plants; for there will be no measurable climatic benefit in return.

3. Prudent Risk Assessment

To say that human-caused global warming is proven to be a dangerous problem is untrue, and to introduce policies aimed at 'stopping climate change' is vainglorious, expensive and futile.

Yet despite the failure of the hypothesis of *dangerous human-caused global warming from carbon dioxide emissions*, everything that we know from the study of ancient climate indicates that a very real climate problem does nonetheless exist. It is the risk of *natural climate change*, both warmings and the much more dangerous coolings.

Study of the geological record reveals many instances of natural climate change of a speed and magnitude that would be hazardous to human life and economic well being should they be revisited upon today's planet. For example, rapid temperature switches of several degrees within a few years to a decade have long been identified in ice core and other records (Taylor et al. 1993; Steffensern et al. 2008; and Brauer et al. 2008). Similarly rapid changes are recorded in the modern instrumental data record. For example, during the 1920s warming in Greenland, at five coastal weather stations the

> 'average annual temperature rose between 2 and 4°C [and by as much as 6°C in winter] in less than ten years.' (Chylek and Lesins 2004)

At the same time, human history records many examples of damaging short-term climatic hazards such as storms, floods and droughts. Many of these varied climatic events, whether they are abrupt or manifest themselves as longer term trends, remain unpredictable – even when viewed with hindsight.

Human influence aside, therefore, it is certain that natural climate change will continue into the future, sometimes driven by unforced internal variations in the climate system and at other times forced by factors that we do not yet understand. To focus on the chimera of human-caused greenhouse warming while ignoring the real threats posed by the natural variability of the climate system itself is self-delusory. Instead, the realities that global climate is currently cooling, that it will both warm and cool again in the future, and that unpredictable, unpreventable and damaging 'weather' events will continue to recur, need to be recognized.

Finally, but importantly, the Australian government needs to seek independent advice on climate change from outside the range of greenhouse and environmental agencies that presently provide it. More competent, less conflicted bodies need to be used to oversee the development

of appropriate, science-based environmental and energy policies, including from time to time judicial commissions or reviews. Continuing research and better, disinterested policy advice is needed on how best to manage Australia's water and agricultural resources, and urban growth, in the context of the natural climate change that is certain to occur.

4. The Need for a Balanced Policy that Covers the Real Risks of Climate Change

In dealing with the certainties and uncertainties of climate change, then, the key issue is prudent risk assessment. As for other natural planetary hazards, policies to cope with climate change should be based upon adaptation to the change as it happens, including appropriate mitigation of undesirable socio-economic effects. Therefore the appropriate public policy response is, first, to monitor climate change accurately in an ongoing way; and, second, to respond and adapt to any changes – including both long term warmings and the likely more damaging coolings – in the same way that we deal with other hazardous natural events such as droughts and storms. New Zealand already has such a national monitoring and response system in place for earthquake, volcanic and flood disasters, called GeoNet, and it is linked appropriately to a parallel compensation and insurance system called the Earthquake Commission[11].

The main certainty is that natural climate change and variation are going to continue, and that some manifestations – droughts, storms and sea-level change, for example – will be expensive to adapt to. But, like the Dutch in the past, adapt we must and will. Adaptation will not be aided by imprudent restructuring of the world's energy economy in pursuit of the chimera of 'stopping' an alleged dangerous human-caused global warming that can neither be demonstrated nor measured.

Even were generous funding to be provided for implementation of a national natural hazard warning and disaster relief scheme – let us call it HazNet – the overall costs would be orders of magnitude less than those caused by the introduction of an unnecessary, ineffectual emissions trading scheme. To boot, contingent damage to the economy, the standard of living and the world food supply would be avoided.

VII. CONCLUSIONS

To focus on the chimera of human-caused greenhouse warming while ignoring the real threats posed by the natural variability of the climate system itself is self-delusion on a grand scale.

- That human-caused climate change will prove dangerous is under strong dispute amongst equally well qualified scientific groups. The null hypothesis, which is yet to be contradicted, is that observed changes in climate or climate-related phenomena are natural unless and until it can be shown otherwise.

  The science of climate change is far from settled. Meanwhile, there is no compelling evidence that human-caused climate change poses a strong future danger.

- No measurable environmental benefits have resulted from actions taken under the Kyoto Protocol, nor can they be predicted to result from carbon dioxide emission

[11] http://www.geonet.org.nz/; http://www.eqc.govt.nz.

restrictions more generally. On the other hand, the social and economic disbenefits of governments deploying such instruments are now reported daily in the media.

The available scientific data, and proved relationships, do not justify the belief that carbon dioxide emission controls can be used as a means of 'managing' or 'stopping' future climate change.

- Bowen (2005) has well written:

  'Science is based upon empiricism – the objective observation of natural phenomena, and the attempt to encompass them in classifications, models and theories of ever-expanding scope. This enormously important principle of the Enlightenment still needs affirming. The principle is under threat, from those of every religious and political persuasion and from those of none, who seek to impose their world view upon scientific enquiry. Science is not more important than morality. But without empiricism, there can be no science'.

  The projections (which are not predictions) of computer modellers that are now almost the sole basis for IPCC climate alarmism must be assessed against the best available empirical evidence.

- Climate variation has always occurred and always will. Citizens are right to be concerned about the possibly damaging effects of both the warmings and coolings which lie ahead. As with most potential natural disasters, however, the appropriate action is to have in place reactive response plans to manage the change when it occurs.

  Dangerous climate extremes will not be prevented by reducing human carbon dioxide emissions, but – as they occur – should be adapted to using similar response strategies to those applied to other dangerous natural events such as earthquakes, volcanic eruptions, tsunami and sea-level change.

- Attempting to 'stop climate change', or, in the present state of our knowledge and technology, even to modify it, is an arcadian fantasy.

  The Australian government should defer its Emissions Trading Scheme bill until the completion of a thorough and independent judicial review into alleged human-caused global warming – as assessed against the reality of dangerous natural climate change.

- Lastly, because we are far from understanding all the climatic feedback loops concerned, cutting carbon dioxide emissions is as likely to 'harm' as to 'help' future climate as judged against a human viewpoint.

  Therefore, application of the principles of 'do no harm' and 'precaution' implies that the correct climate policy is one of monitoring climate change as it happens, adapting to any deleterious trends that emerge, and compensating those who are disadvantaged through no fault of their own.[12]

[12] More information can be found at: http://members.iinet.net.au/~glrmc; see especially listed paper 55.

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FIGURES 1-8

Temperature records for the globe for periods of time over the last 6 million to the last 6 years. Direct measurements of temperature are not possible prior to about 150 years ago, so Figures 1-4 are based upon measurements of temperature proxies in core records. Figures 1-3 represent local/regional temperatures; Figures 4-8 represent estimates of global temperatures. More detailed comments on each figure are provided in their captions and the accompanying text.

Figure 1: Composite deep ocean temperature curve from DSDP Sites 86 and 849, North Pacific, over the last 6 million years (proxy: oxygen isotope ratios in marine core; diagram courtesy Alan Mix, after Mix et al. 1995a, b).

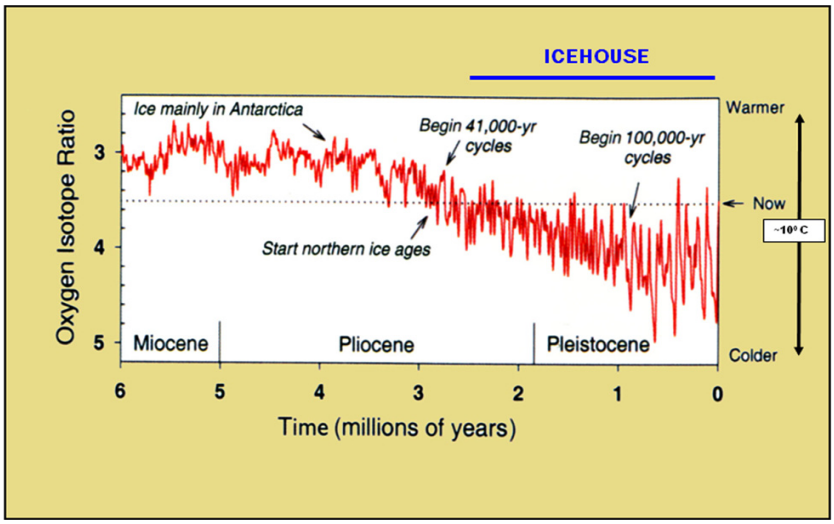

Figure 2: Surface air temperature at Vostok station, Antarctica over the last 400,000 years (proxy: deuterium isotope ratios in ice core (Salamatin et al. 1998)).

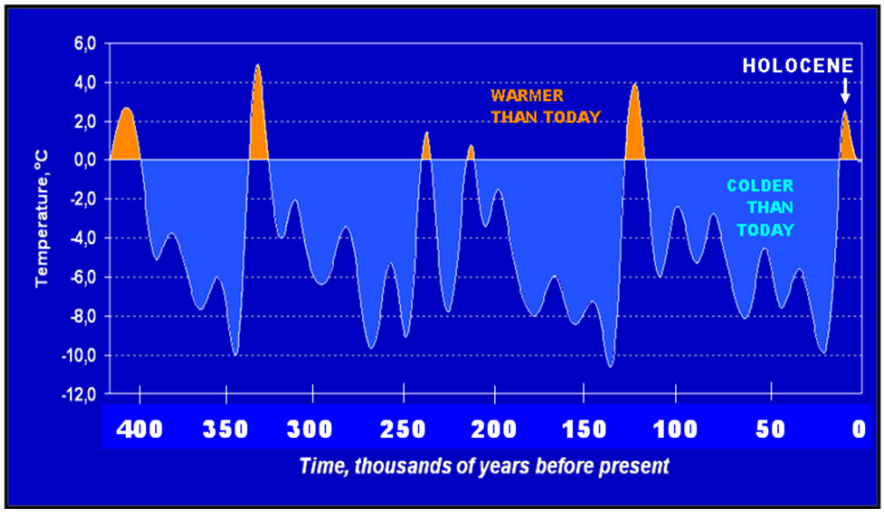

Figure 3: Surface air temperature above the Greenland ice cap over the last 5,000 years (proxy: deuterium isotope ratios in ice core (Grootes et al. 1993) green stripes, warm periods; black line, moving average).

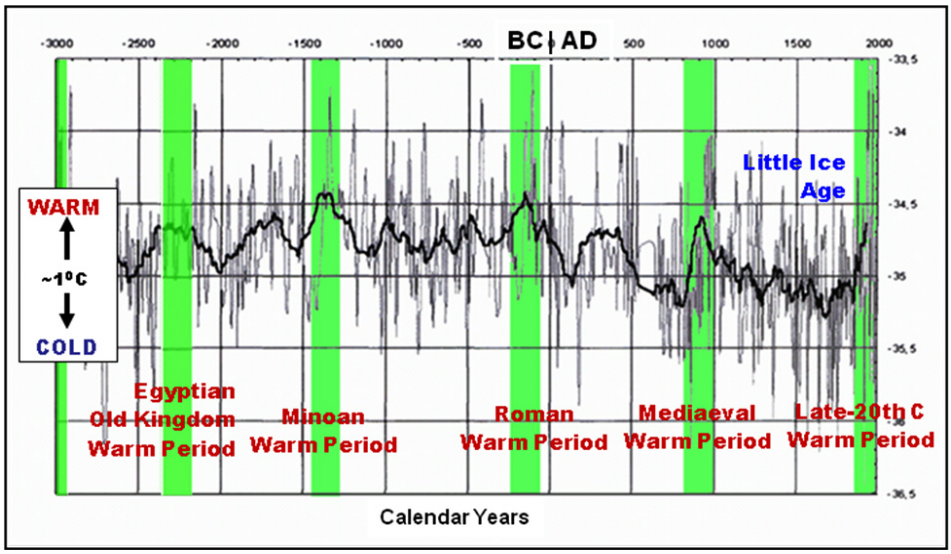

Figure 4: Estimated surface global temperature record over the last 2,000 years (proxies: variable, including from lake cores (pollen), ice cores and speleothems (Loehle and McCulloch 2008) dotted lines envelope, error estimate).

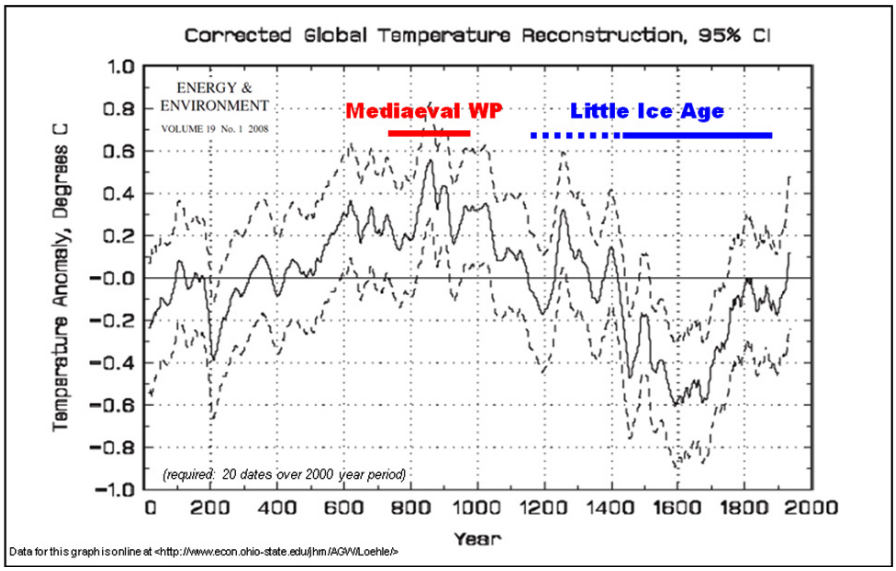

Figure 5: Estimated surface global temperature record over the last 150 years (averaged worldwide thermometer measurements (U.K. Hadley Centre 2008) grey bars, error estimate; blue line, 21-point moving average).

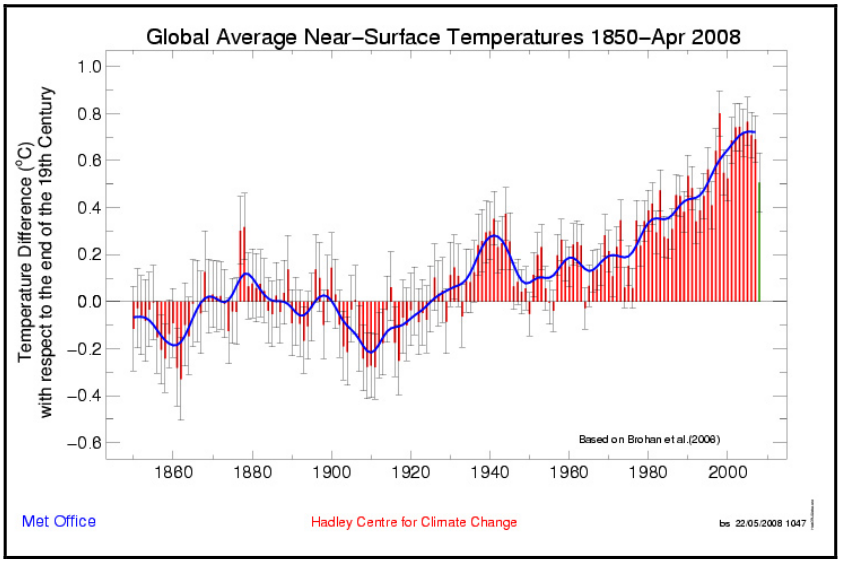

Figure 6: Estimated lower troposphere global temperature record over the last 50 years (averaged worldwide radiosonde measurements from weather balloons (Thorne et al. 2005).

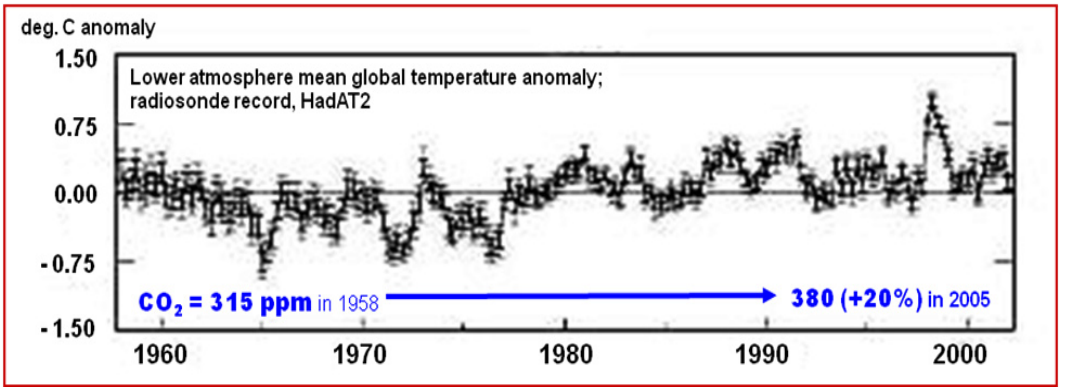

Figure 7: Estimated lower troposphere global temperature record over the last 29 years (averaged worldwide microwave sensing unit (MSU) measurements from satellites; Christy and Spencer, University of Alabama, Huntsville – blue line; Remote Sensing Systems – blue line).

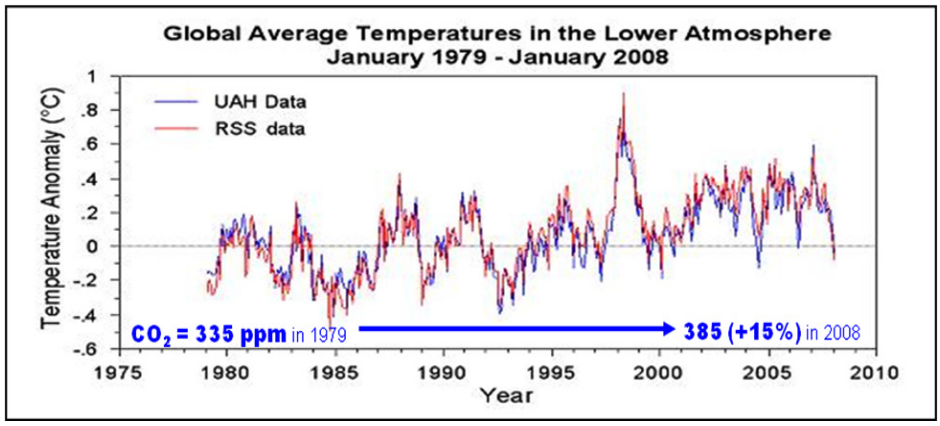

Figure 8: Estimated global lower troposphere (blue plot; MSU measurements) and ground surface (purple plot; Hadley CRU) temperature records over the last 6 years, with fitted cooling trendlines.

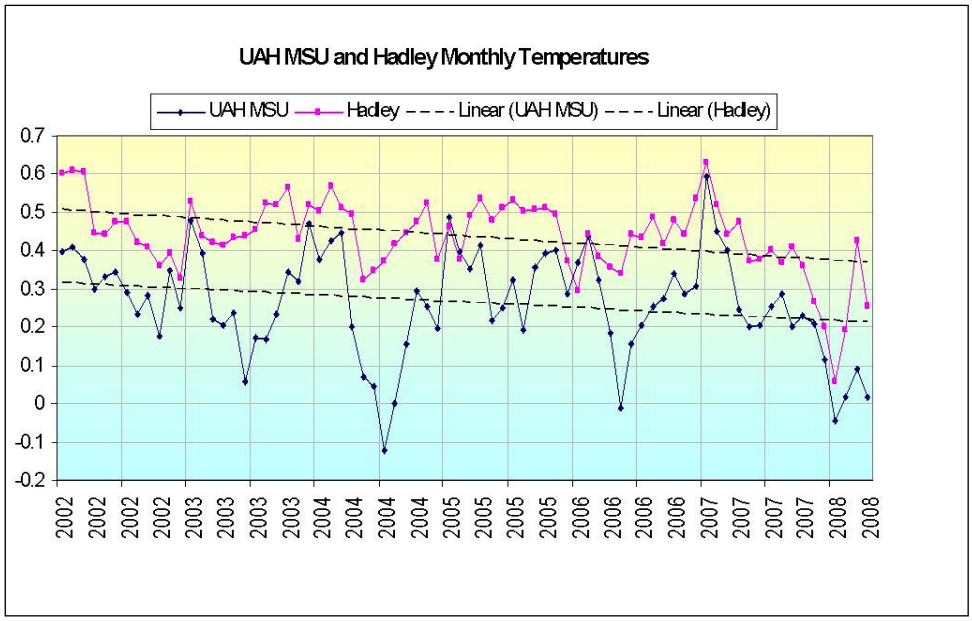

Figure 9: Calculated tem perature increases (x-axis) for successive 20 ppm increments of atmospheric carbon dioxide (y-axis) up to 400 ppm (MODTRANS (Archibald 2007)).

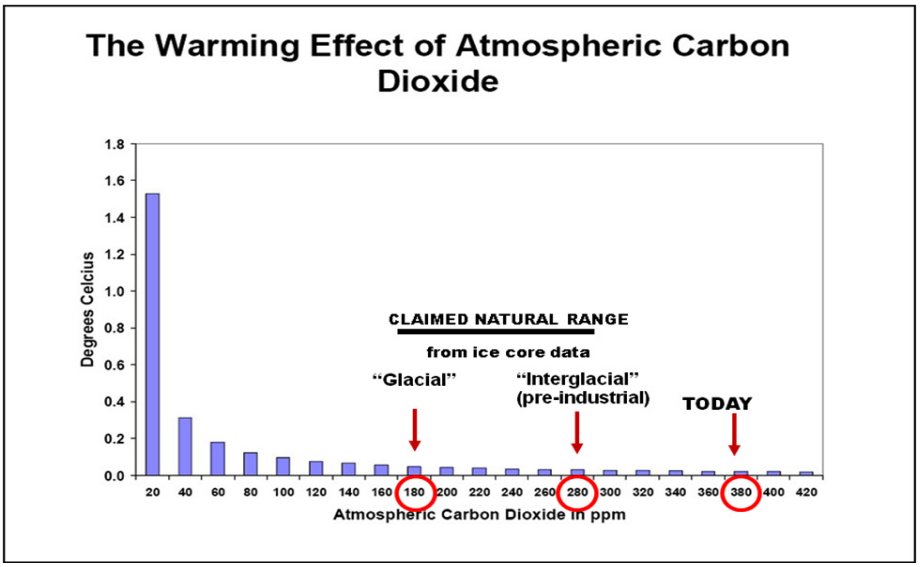

Figure 10: Comparison between measured surface temperature to 2005 (black line), IPCC model projections of future temperature (red line plus scatter of estimates represented by purple envelope) and projection of the 2001-2008 cooling trend (Liljegren 2008). Note that the all IPCC projections now fall outside the error bounds of the trend based on the elapsed temperature record.