NIPCC *vs.* IPCC

Addressing the Disparity between Climate Models and Observations: Testing the Hypothesis of Anthropogenic Global Warming (AGW)

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This booklet discusses:
(1) The central issue, the **cause of global warming**: Is it natural or is it manmade? – and updates the ongoing controversy.
(2) The **chaotic uncertainties of climate models** and how to overcome them.
(3) New thinking on **Climategate, Hockeystick graph** -- and what we can say about the absence of post-1979 warming in the **temperature data of the 20th century**.

Conclusion

(1) We have given here a description of the controversy about the cause of climate change in the 20th century. There is never any question about the observed increases in greenhouse (GH) gases or about their human cause. But we see no evidence at all that any of the temperature changes were anthropogenic. We certainly do not see any effect that can be traced to greenhouse gases, such as CO2.

(2) Climate models are known to be chaotic. None of current models have a sufficient number of runs to overcome chaotic uncertainty and therefore cannot be validated against observations.

(3) The global surface warming for 1979 – 1997, reported by CRU-Hadley, NCDC-NOAA, and GISS-NASA, and used by the IPCC to support its claim of a GH-gas cause, is problematic. It is not seen by any other observations; we cite six independent methods, incl. radiosonde, satellite, and proxy data.

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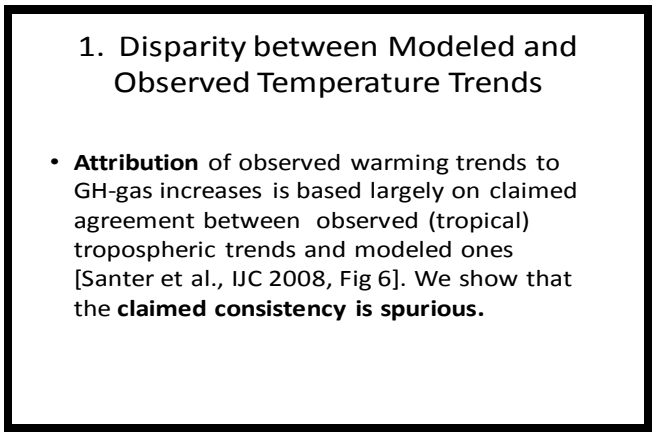
1. The Controversy about "Attribution" – Cause of Climate Change.

Without question, the central issue in climate science is to determine whether the human contribution to the warming of the 20th century is significant. This is quite a difficult problem. There is no reason to think that natural forcings have suddenly ceased. But anthropogenic global warming (AGW) is certainly plausible: the level of greenhouse (OH) gases has been increasing steadily as a result of human activities – mostly the burning of fossil fuels to generate energy. But how to determine the "climate sensitivity" to GH gases?

The IPCC has wavered on methodology. Their Frst Assessment Report (FAR--1990) simply pointed out that both GH gases and temperatures have increased but paid little attention to the long cooling period (from 1940 to 1975). Their Second Report (SAR--1996) tried to show that observed patterns of warming trends ("fingerprints") agreed with calculated patterns. Their Third Report (TAR--2001) simply claimed that the 20th century was the warmest in 1000 years (as if this proves anything). The fourth report (AR4--2007) basically said: We understand all natural forcings – so everything else must be anthropogenic.

NIPCC agrees with IPCC that the fingerprint method can tell if AGW is significant – but we disagree about the result. IPCC (see Chapter 8 in IPCC-SAR 1996) has been claiming agreement between modeled and observed trends. NIPCC (2008) says that this claim is spurious; there is no agreement. [For a history, see Singer in *Energy&Environment* 2011; he discusses the text changes made after approval by Chapter-8 authors but before printing, and the data selection and changes in crucial graphs -- and how this 1996 IPCC report led to the 1997 Kyoto Protocol (which has already caused a waste of several hundred billions of dollars)]

While AR4 now asserts to be 90 - 99% sure that the warming of the late 20th century is anthropogenic, they have no solid evidence to back this claim. To the contrary, their own data demonstrate the opposite. All IPCC climate models show an amplification of trends in the tropical zone, with a "hot spot" in the upper troposphere [**Fig. 1**] -- while the temperature data from radiosondes (both the Hadley Centre analysis and the RATPAC analysis by NOAA) do not show this feature. [**Fig. 2**]



CCSP 1.1 – Chapter 1, Figure 1.3F PCM Simulations of Zonal-Mean Atmospheric Temperature Change

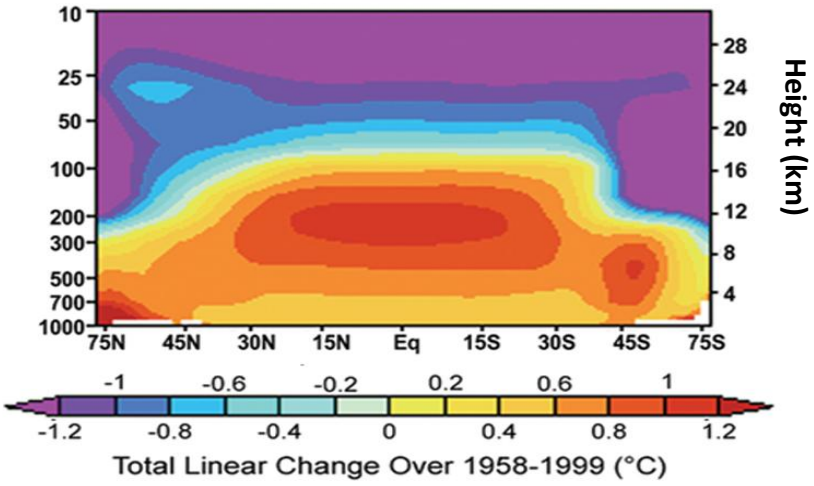


Fig. 1: GH-model-predicted temperature trends versus latitude and altitude [this is figure 1.3F from CCSP 2006, p.25]. Note increasing trends in tropical mid-troposphere, with a maximum around 10 km.

CCSP 1.1 – Chapter 5, Figure 7E

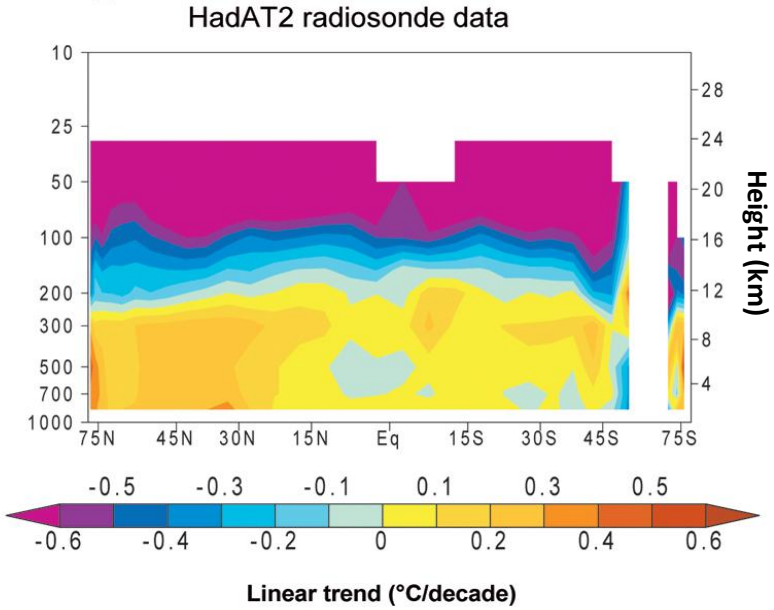


Fig. 2: Observed temperature trends versus latitude and altitude [this is figure 5.7E from CCSP 2006, p.116]. Note the absence of increasing trends (i.e., no "hot spot") in tropical mid-troposphere. Note also NH and polar warming relative to SH. (No radiosonde data in white rectangle in SH)

This information from IPCC-4 (2007) is also featured in Chapter 5 [BD Santer, lead author] of the 2006 report of the US Climate Change Science Program CCSP-SAP-1.1 [2006]. And it is the central feature of the 2008 NIPCC summary report. Douglass et al (DCPS in *IJC* 2007) have extended this discussion. Their analysis (**Fig. 3)** shows modeled trends increasing with altitude, while observed trends decrease.

The DCPS conclusion has been challenged by Santer and 16 (!) coauthors (in *IJC* 2008), who claim that modeled and observed trends are "consistent." They introduce a new set of temperature data and also expand the error bars of the modeled trends, thereby suggesting an overlap between models and observations. [**Fig. 4A**]. However, Singer (*E&E* 2011) has shown that Santer's new set of atmospheric temperature trends is spurious and does not agree with satellite data [**Fig. 5]**– contrary to his claims [**Fig. 4B]**. Singer also showed that the claimed error bars of the model trends are based on an artifact [**Fig. 6]**. Therefore, observed and model trends are not consistent, and the conclusion of DCPS [2007] is reaffirmed: There is a substantial disparity between observed trends and those derived from IPCC's greenhouse (GH) models – contrary to Santer et al (2008) -- therefore invalidating the IPCC 2007 conclusion about substantial anthropogenic global warming (AGW).

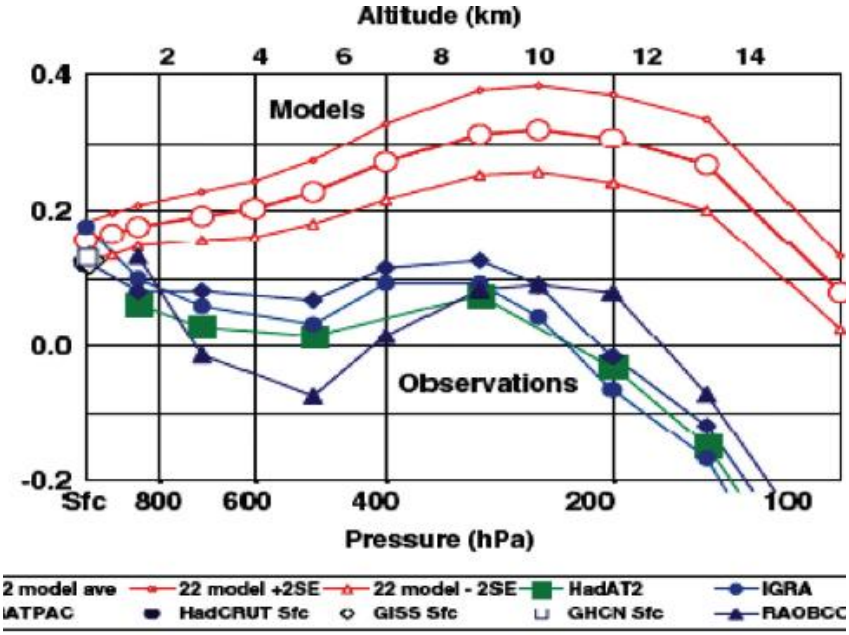


Fig. 3: Temperature trends vs altitude in the tropics [Douglass, Christy, Pearson, Singer. IJC 2007]. Note DCPS claimed disparity between modeled and observed (NOAA-RATPAC and Hadley) radiosonde trends.

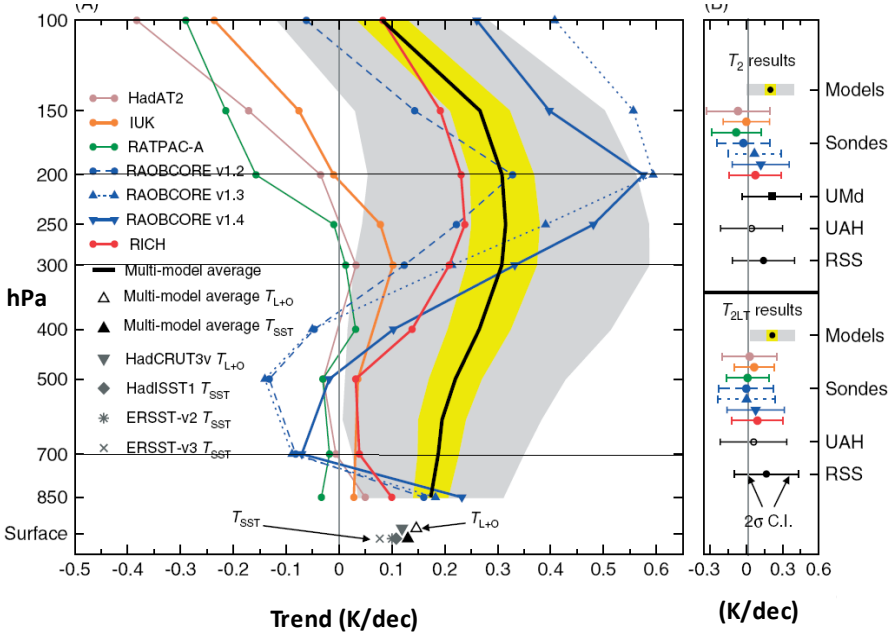


Fig. 4: (This is figure 6 of Santer et al [IJC 2008]). It suggests "consistency" -- with models (grey area) overlapping with "new" datasets. The new datasets are spurious – even though it is claimed that they are supported by satellite-MSU data (see Panel B, on right). This claim is shown to be incorrect [**Fig. 5**]. The model uncertainties (grey area), based on an elaborate statistical analysis, are likely an artifact [see **Fig. 6**]. (The narrower yellow area shows DCPS model uncertainties.)

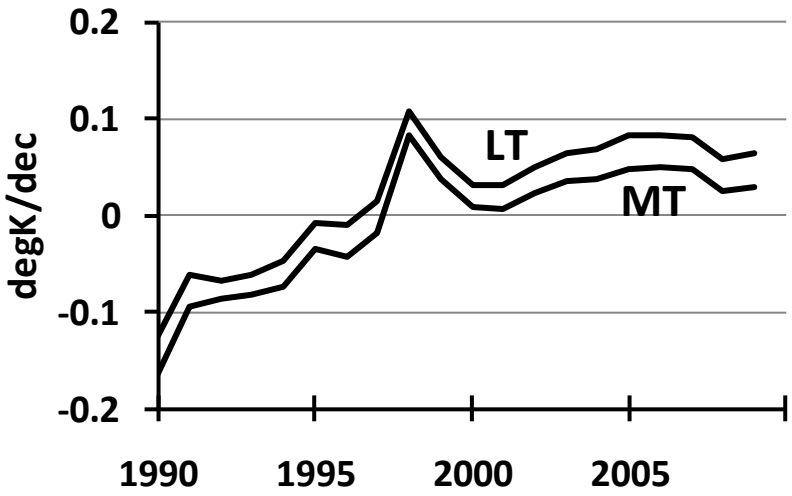


Fig. 5: Tropical Temperature trends from 1979 to Year xx. RATPAC and Hadley datasets are supported by satellite results (MT minus LT); the other datasets of Fig. 4A are not – contrary to claims of Fig. 4B. Note that both LT (Lower Troposphere; main contribution from around 700 hPa) and MT (Middle Troposphere; main contribution from around 400 hPa) trends are close to zero. (Negative trends before 1997 may be a reflection of the effects of volcanic eruptions El Chichon and Pinatubo. The slightly lower MT trends may reflect the influence of stratospheric cooling.)

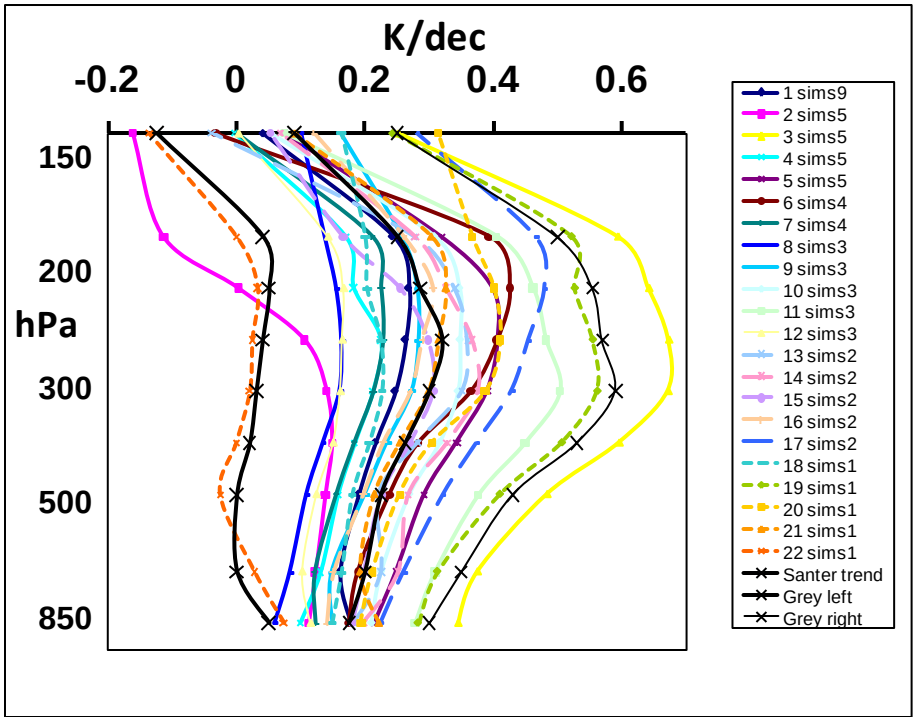


Fig. 6: Trends vs altitude of the 22 IPCC models (of '20CEN'). Half of them have only 1 or 2 runs; none have more than five. Note that the limits of the 'grey area' of Fig. 4A (marked here with crosses) coincide with single-run models. (This suggests that the extent of the grey area is the result of chaotic uncertainty.)

Summary of Section 1

There is a substantial disparity between observed atmospheric trends and those derived from IPCC greenhouse (GH) models [NIPCC 2008].

Critiques of NIPCC [e.g., Santer et al *IJC* 2008] do not stand up to close examination [Singer *Energy&Envir* 2011]

Hence, the IPCC [2007] claim of a substantial anthropogenic contribution to climate change (through GH-gas generation) cannot be maintained.

2. Overcoming Chaotic Uncertainty of Climate Models

It is well accepted that climate models, all based on nonlinear partial differential equations, are chaotic – as also admitted by the IPCC [see BOX p.8]. This means that the trend obtained from a particular model run depends strongly on the initial conditions. Consequently, most careful modelers will carry out more than one run, using the identical model – and sometimes up to 5 runs – and then form what is called the "ensemble-mean." **Fig. 7** shows the results of 5 runs of the Japanese MRI (Meteorological Research Institute) model. As can be seen, the individual trends differ by almost an order of magnitude. There is no way to tell which of these 5 trend values, or even their average, the ensemble mean, is "correct," and should be compared to the observed trend.

A separate investigation of this problem shows that 10 or more runs are required to obtain a stable asymptotic value for the ensemble mean – if the runs have a length of 40 years. With a run length of 20 years (typical of the IPCC compilation) one needs at least 20 runs [**Fig. 8**]. Equivalently, with 20 or more runs, the spread in trend values is reduced to near-zero. I believe the spread in model trends shown by Santer [**Fig. 4A]** is due to the fact that of the 22 IPCC models used, ten are only based on 1 or 2 runs and therefore show inherent high chaotic variability. None of the rest use more than 5 runs. (In addition, of course, each individual model uses slightly different forcings and parameterizations, leading to structural differences between the models and therefore causing a small additional spread in trend values).

This result implies that NONE of the 22 IPCC climate models can be validated against observations.

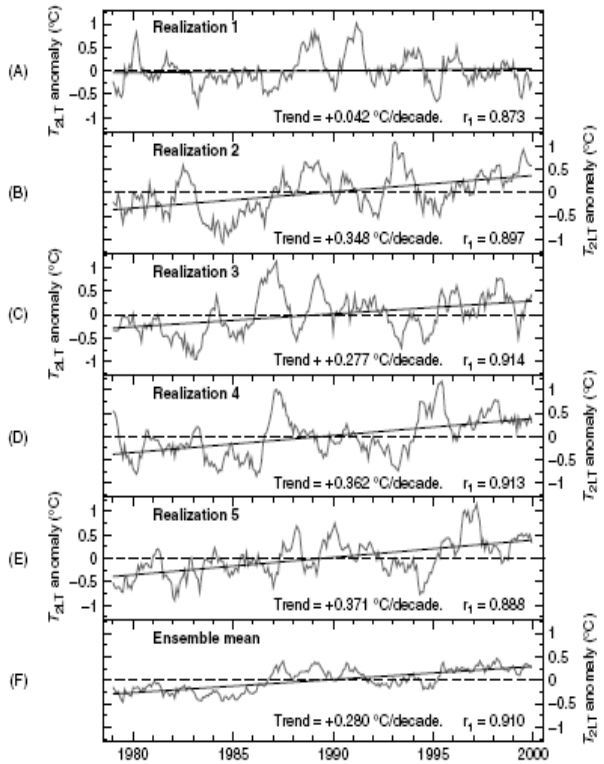


Fig 7: A demonstration of Chaotic Uncertainty: Five runs and "ensemble-mean" of the Japanese MRI climate model, as shown by Santer et al [IJC 2008]. Note that the individual temperature trends differ by nearly an order of magnitude. Which one should we compare with the observed trend?

The IPCC's Third Assessment Report (2001) candidly acknowledged that the limited understanding of climate processes necessarily makes climate modeling an uncertain exercise:

"In sum, a strategy must recognize what is possible. In climate research and modeling, we should recognize that we are dealing with a coupled nonlinear **chaotic** system, and therefore that *long-term prediction of future climate states is not possible*." – [TAR 2001, Section 142.2.2, p774]

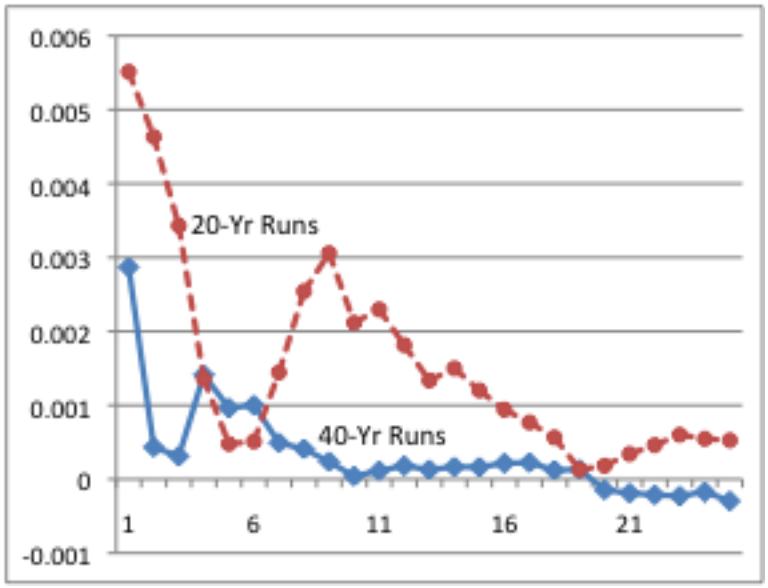


Fig 8: Cumulative "Ensemble-Mean" Trends vs Number of Runs: A synthetic experiment with an unforced 1000-yr control run shows that at least 10 runs are necessary to form a stable asymptotic cumulative ensemble-mean (for a run-length of 40 years) and at least 20 runs for a run-length of 20 years. [But there are no IPCC climate models with more than five runs.]

Summary of Section 2

- **Chaotic variability of climate models can be overcome by averaging the trends of a large number of runs of a particular model—generally 10, 20, or more runs.**

- **In practice this means that IPCC climate models (having one, two, and never more than five runs) cannot be validated**

3. Hockeystick, Climategate, and 20th-Century Climate Changes

The surface thermometer record of the 20th century seems to show two major global warmings: between 1910 and 1940; and between 1979 and 2000. [**Fig. 9**] (Note that the US record does not show a major warming between 1979-1997.) I will try to demonstrate here that the earlier warming is genuine but that the latter warming is not real. (The cooling trend, from about 1940 to 1976, and the sudden "warming step" around 1977 are not in accord with any GH warming.) We therefore select the interval 1979-1997 for further discussion; we could also choose 1979-2000, but with the 1998 super-El-Nino removed.

The 1910 to 1940 warming is seen in the surface thermometer record; there were no balloon or satellite observations to provide independent confirmation. However, the proxy data of tree rings, ice cores, etc, all show this warming so that we can be fairly sure of its reality. Its cause is generally believed to be due to natural factors, although Wigley and Santer have claimed it to be anthropogenic (*Science*, 1998).

On the other hand, the reported 1979 to 1997 surface warming [**Fig. 10]** is not seen by atmospheric observations. [**Fig. 11**]. If one takes the near-zero atmospheric trends from radiosondes and (independent) satellite instruments **[Fig. 5]** seriously, then – because of "amplification" -- the surface trend should be smaller – and therefore even closer to zero-- especially in the tropical zone.

[The theory of trend amplification is well accepted and discussed in most meteorology texts (see, e.g., Wallace and Hobbs). It is based on the "moist adiabatic adjustment" of the atmospheric lapse rate to surface warming. The tropical lapse rate is controlled by convective activity that transports latent energy from the ocean surface into the troposphere – to be released there when cumulus clouds rain out.]

A variety of independent climate data can be used to verify (or not) the observations reported from surface thermometers on land and ocean for the interval 1979-1997.

Independent Climate Data used to Verify (or not) the Land Surface Trend

- Trend is not seen in satellite and (independent) balloon data of 1979-1997
- Atm-Sfc "moist adiabatic" **amplification** is real, but is found only for shorter intervals, **not on decadal scale**
- **SST** warming is questionable; may be an artifact of buoy data. Trend is not seen in **OHC** (Ocean Heat Content) record
- Absence of temperature rise is in accord with **solar** data and Sea-level rise data
- **Proxies** do not show post-1979 warming; the absence of a temperature rise is "hidden" by "Mike's *Nature* trick" by cutting off display of proxy analysis in 1979

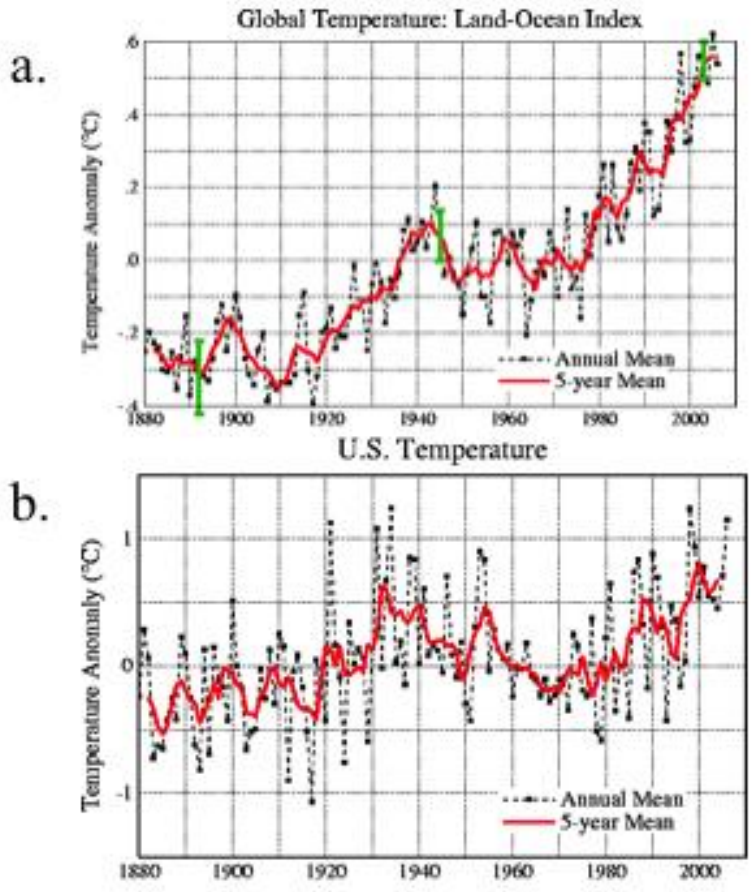


Fig 9: The temp rise of 1910-1940 is genuine; however, the 1979-1997 rise shown is not supported by other, independent evidence. Note that the US record does not show a major warming between 1979-1997
For all graphs:
http://data.giss.nasa.gov/gistemp/graphs/

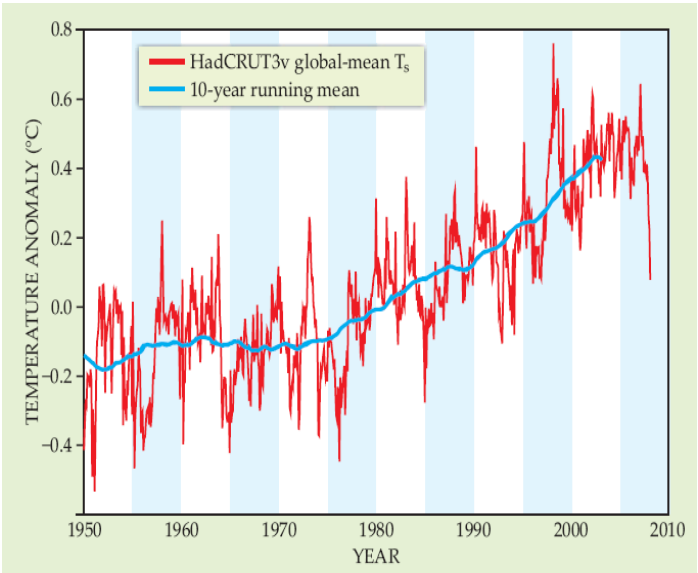


Figure 2. Observed monthly global temperature anomalies since 1950. The red curve is the HadCRUT3v data set of global-mean near-surface air temperature, T_s, the standard meteorological temperature measurement. The blue curve is a 10-year running mean. (Data are from the climatic research unit, University of East Anglia, UK.)

Fig 10: The post-1979 temperature rise shown here is widely believed. Note that HadCRU shows a 1998 peak while the GISS analysis (Fig.9) does not. (The smoothing algorithm used here leads to the illusion of an enhanced trend.)
Source: Duffy, Santer, Wigley in *Physics Today* [Jan 2010]

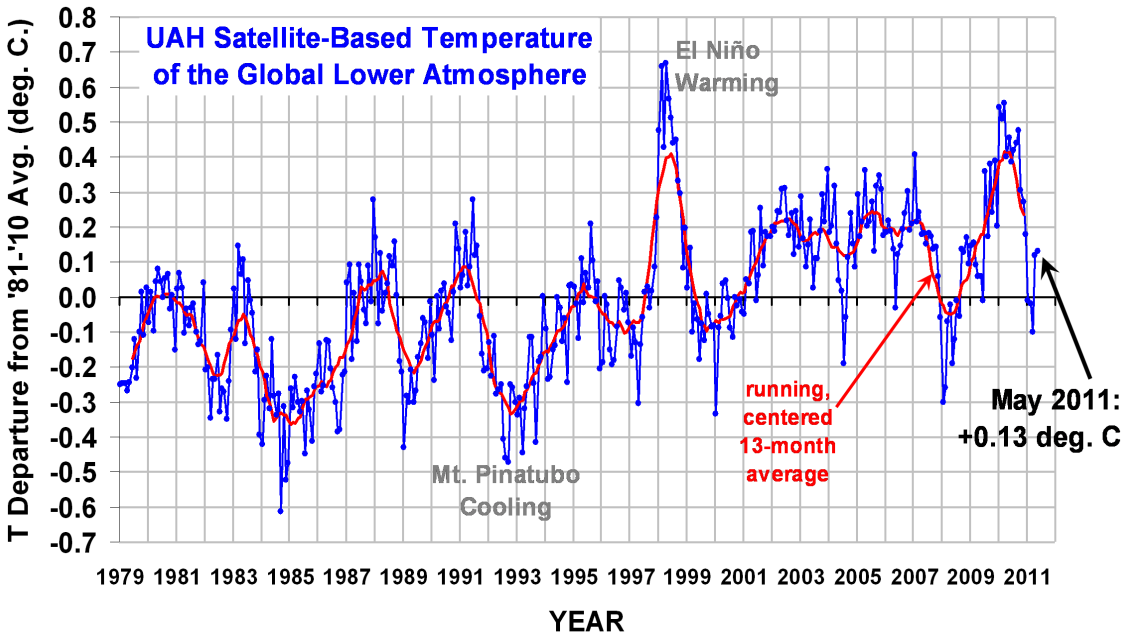
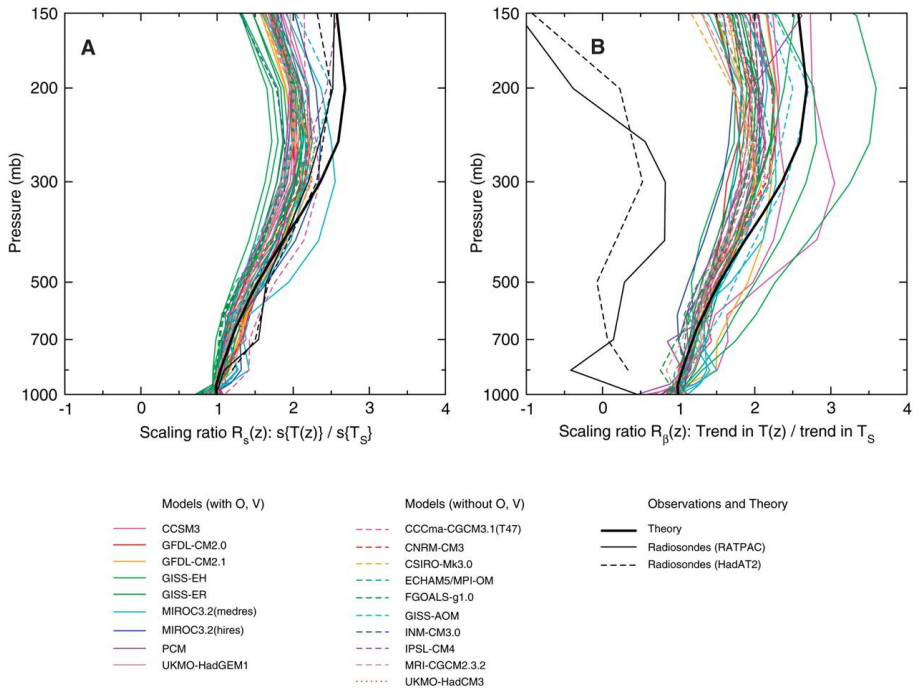


Fig 11: Satellite-MSU (global LT) data, independently verified by balloon radiosondes, show no significant 1979-1997 warming (contrary to Fig 10). Note the cooling from volcanic eruptions Agung 1963-64, El Chichon 1982, and Pinatubo 1991.

[The MSU-UAH satellite temperature record of the University of Alabama-Huntsville has survived repeated attacks, launched because it disagreed so sharply with the surface record (that showed warming). Unlike competing analyses, MSU-UAH is supported by the independent data from balloon-borne radiosondes.]



B D Santer et al. Science 2005;309:1551-1556

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Fig 12: Atmospheric profiles of temperature scaling ratios in models, theory, and radiosonde data. (A) RS (z) is the ratio between the temporal standard deviations of T(z), the temperature at discrete pressure levels, and the surface temperature TS. (B) Rβ(z) is similarly defined, but for trends over 1979 to 1999. Model results are from 49 realizations of the IPCC historical forcing experiment. Radiosonde scaling ratios were calculated with HadAT2 and RATPAC T(z) data. (Scaling ratios for HadAT2 are based on unsubsampled HadCRUT2v TS data. HadCRUT2v TS data subsampled with HadAT2 coverage yield virtually identical scaling ratios (not shown). RATPAC-derived scaling ratios use spatially complete NOAA TS data.)

Theoretically expected values of RS(z) and Rβ(z) are also shown. All standard deviations in panel (A) were calculated with linearly detrended data. (Rβ(z) results in panel (B) are not plotted for three model realizations with surface warming close to zero.) All results are for spatial averages over 20°N to 20°S. [Source: B D Santer et al. *Science* 2005;309:1551-1556]

Curiously, this theory of trend amplification (shown also in Fig. 1) is verified (but not recognized) by data collected by Santer and 24 (!) coauthors (*Science* 2005). They find that the amplification of surface trends exists in the tropical atmosphere for time intervals on the order of months [**Fig. 12A**], but not for decadal time intervals [**Fig. 12B]**. This lack of amplification they regard as a "puzzle." But the puzzle is easily solved if we accept the fact that there is little if any surface warming. (If one amplifies a zero trend by a factor of 2 or 3, the answer will still be zero.)

Land Data Problems: One still has to explain why weather station records seem to show a warming between 1979 and 2000, while satellites do not. It is well known that the quality of the surface temperature data is dubious (D'Aleo, Watts). In addition to poor location, an uncertain history of many of the stations, there is the overall problem of the urban heat island effect [**Fig. 13]**.

The e-mails released in the Climategate scandal suggest also that there has been a selection and correction process that may have favored the production of a warming trend. (**Fig. 14** shows an example of such a selection in California.) This matter has not been investigated fully, but looms as a possibility, especially since the number of stations used since 1970 has been cut severely [**Fig. 15]**. As a result, the sampling population has changed, with the proportion of low-latitude and low-altitude stations increasing – thus introducing a warming bias. A further warming bias comes from the selection of stations, with the "best" stations usually located at airports. While airports may generally be warming, that's not global warming.

None of the investigations of the Climategate principals has delved into this question. At the present time, the Berkeley-Earth Project is investigating this difficult but important matter. We should wait to see what they report.

Solar "Paradox": Meanwhile, we note that the absence of warming between 1979 and 1997 provides a possible explanation for the paradox raised by Lockwood/Frohlich against the Svensmark hypothesis of climate forcing by solar activity [see **Box]**.

Solar "Paradox" of Lockwood-Frohlich [ProcRoySoc 2007, 2008]

•*"There is considerable evidence for solar influence on the Earth's pre-industrial climate and the Sun may well have been a factor in post-industrial climate change in the first half of the last century. Here we show that over the past 20 years, all the trends in the Sun that could have had an influence on the Earth's climate have been in the opposite direction to that required to explain the observed rise in global mean temperatures*." [emphasis added]

•**Comment**: The absence of this reported 1979-1997 surface warming explains the (artificial) paradox

We also note that there is no conflict between the absence of a surface warming trend and the reported tidal-gauge data on sea-level rise [**Fig. 16],** which shows no acceleration even during the temperature rise of 1910-1940.

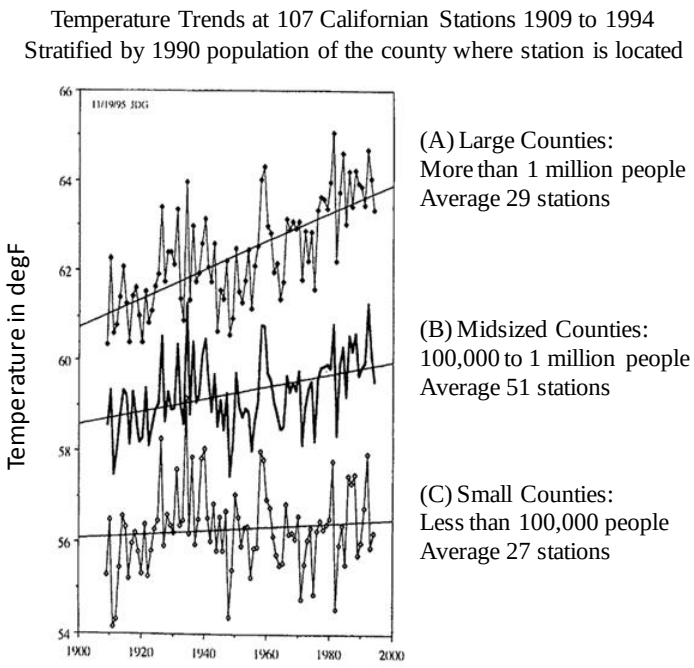

Fig 13: [From HTCS (1997) Fig. 11] Urban Heat Island (UHI) effect: The observed temperature trends are shown to depend on the population density. Note that all three [High, Medium and Low population density] show a temperature rise up to 1940, followed by a cooling.

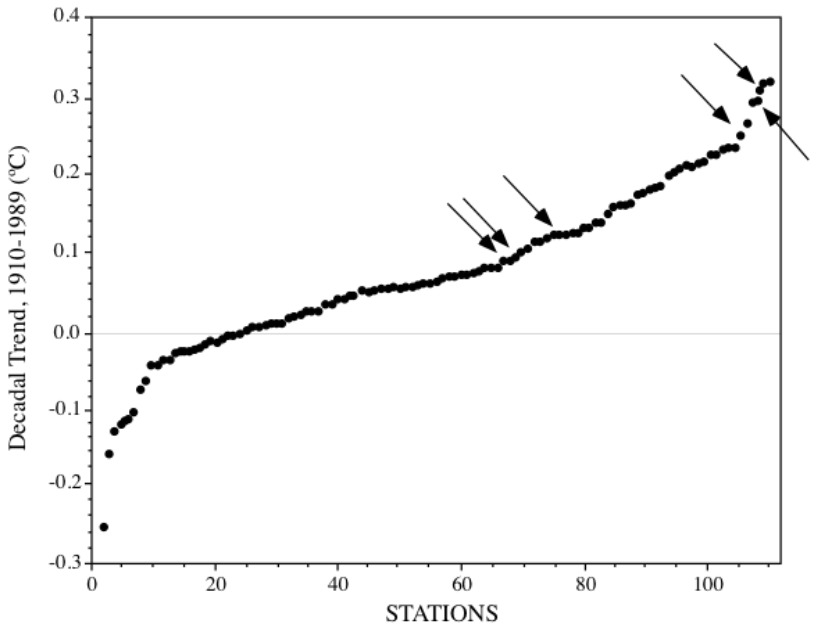

Fig 14: [From HTCS (1997) Fig. 17] Distribution of temperature trends for the California weather stations of Fig 13. The arrows indicate the stations selected by GISS for a global temperature compilation [Christy and Goodridge 1995].

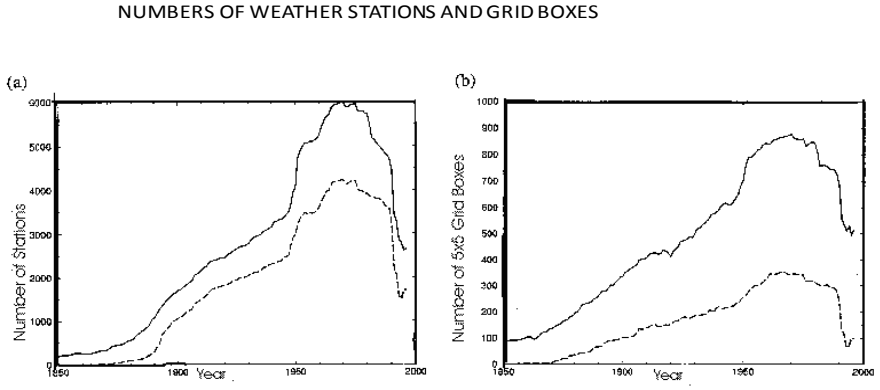

Fig 15: [Fig. 12 of NIPCC] Number of weather stations declined drastically after 1970, as did the number of grid boxes covered. The change in the sampling population favored lower-altitude, lower-latitude stations, as well as airports, leading to a warming bias.

Sea-level trends for 84 stations with more than 37 years of data [Trupin and Wahr 1990], corrected for post-glacial rebound. Occurrences of major El Niño events are indicated on the time axis; they generally correlate with dips in sea level.

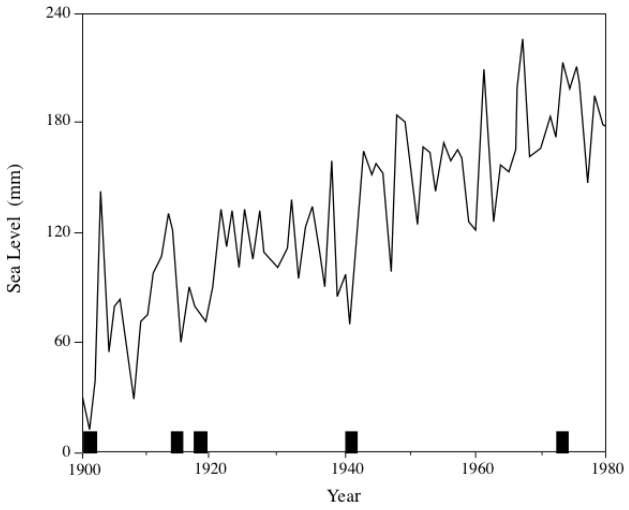

Fig 16: [Fig 21 of HTCS] Tidal-gauge data [Trupin & Wahr]: Note independence of rate of Sea Level rise on global temperature – and even a suggestion of a reduced rate of rise during the 1920-40 warming period.

Ocean Data: In addition to explaining the absence of warming in the land/surface record, one has to account also for an absence of GH warming of the ocean, i.e., for a near-zero trend in tropical SST (sea surface temperature). As a first step, we note that the satellites show a near-zero trend both over land and ocean; there is no difference [**Fig. 17]**. But how to account for the rise of the SST reported by the IPCC?

Sea Surface Temperatures are measured with different techniques (buckets, ship inlets or hulls, drifter and other buoys, satellites) – which leads to problems when data are merged. Surprisingly, though not subject to land problems (like Urban Heat Islands); SST warming may turn out to be greatly exaggerated. Floating drifter buoys experience warmer temperatures (esp. during day-time) than ship inlets. The increasing proportion of buoy data can produce an artificial warming trend {Singer 2005, 2006].

I have suggested [2005, 2006] that this is an artifact, caused by the increasing proportion of data from drifter buoys in relation to data from ships [**see Box].** Buoys, floating near the sea surface, record a warmer temperature because of direct solar heating of the ocean [**Fig. 18**]. The overall effect then would be to generate a warming trend that is artificial. (The effect should saturate as the contribution from buoys approaches 100%. Further, day-time values of SST should be greater than night-time values.)

One still has to explain why the normal greenhouse effect is not observed for SST. Along with increasing CO2 (and water vapor) there should be an increase in the downwelling infrared radiation to the sea surface (except for cases of temperature inversions). However, we know from physical optics, that such IR radiation is absorbed in a "skin" which is only about 10 microns thick. The question then arises how much of this downwelling energy is shared by the bulk ocean (through rapid mixing) and how much is immediately re-radiated or spent on additional evaporation from the skin. Opinions on this matter are divided, but actual data are hard to come by.

Floating Drifter Buoys Introduce an Artificial Trend:

The claimed SST warming may be close to zero and an artifact of the measurements that combine ship and buoy data. We base this assertion on satellite and independent radiosonde data, as well as on ocean heat content (OHC) data. Observations of late 20th century Sea Level Rise (SLR) and of solar activity changes do not support significant global SST warming -- nor do proxy data (corals).

- Temperature Data from Buoys Rose from Zero (1980) to 90% (2010):
  The contribution from drifter buoys rose almost linearly from 0% in 1980 to 72% in 2010.
  During the same interval, moored buoys rose from 0% to 18%

- ***Ref: Composition of ICOADSv2.5.1 Annual number of sea surface temperature observations per year by platform type,*** *expressed as a fraction of total number of observations. [Figure 2 of* ***Effects of instrumentation changes on sea surface temperature measured in situ,*** *Elizabeth C. Kent, et al. online: 17 MAY 2010. DOI: 10.1002/wcc.55.* ***Issue: Wiley Interdisciplinary Reviews: Climate Change Volume 1, Issue 5, pages 718–728, September/October 2010***

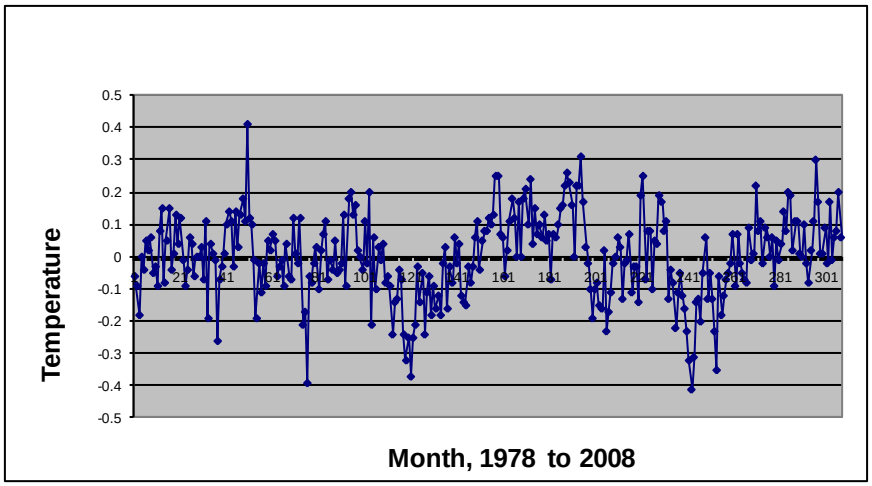

Fig 17: Ocean-minus-land temperatures. Little difference is seen between (tropical lower-troposphere) temperatures over land and oceans (as measured by satellites).

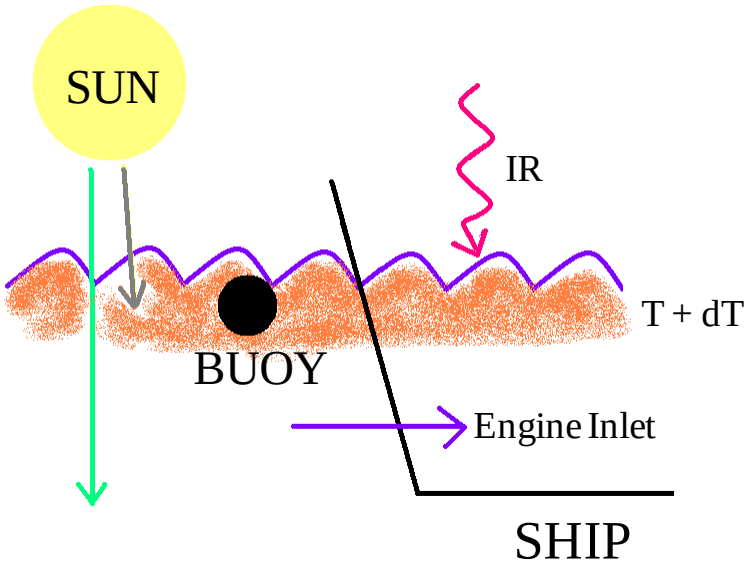

Fig 18: [NIPCC 2008 Fig.20] Cartoon showing absorption of visible and IR radiation and locations of buoys and ship temperature monitors.

Fortunately, there is independent evidence on SST available from data on ocean heat content (OHC), the heat stored in the ocean as a result of surface heating. The (rather uncertain) data on OHC seem to show no significant increase between 1979 and 1997 – although the 1998 El Nino warming does make an impact [**Fig. 19**]. Allowing for the poor quality of the data, one may interpret this result as compatible with little or even no increase in SST. (It also suggests that only a small fraction of downwelling IR radiation contributes to SST.)

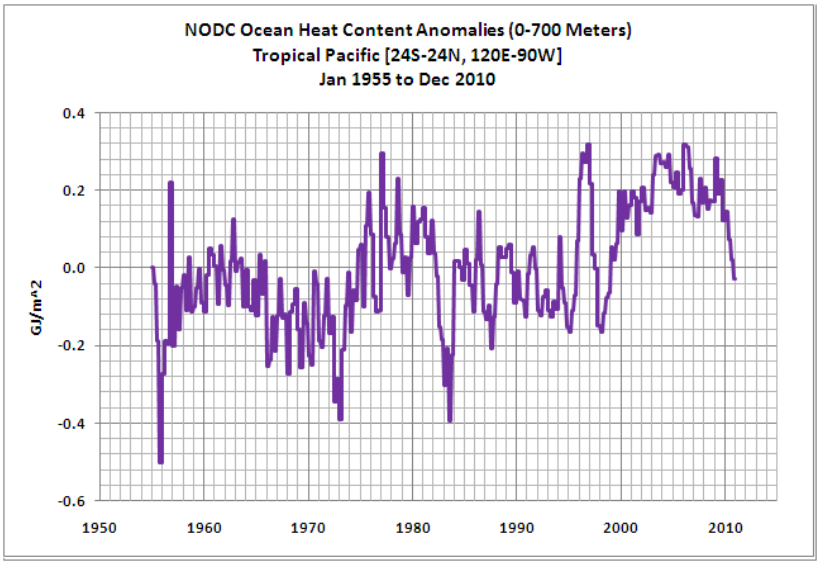

Fig 19: Ocean Heat Content (OHC) shows no perceptible increase between 1979 and 1997, supporting the hypothesis of no SST warming

Proxy Data: One word about the relationship between **Climategate** and the **"Hockeystick**" temperature graph of Mann, Bradley, and Hughes. When the graph was published [*Nature* 1998, *GRL* 1999], public attention immediately focused on their claim that the 20th century was the warmest in the last 1000 years **[Fig. 20].** It was then shown by McIntyre and McKitrick that some of the data had been fudged and that the statistical methodology used was faulty. They also demonstrated that feeding random data into the Michael Mann's algorithms would invariably yield a hockeystick curve. (Mann [*PNAS* 2008] has now quietly changed the hockeystick into a graph that shows both the Medieval Warm Period (MWP) and Little Ice Age [**Fig. 21]**.) In any case, we know that the MWP, around 1000 to 1200 AD, was warmer than today, based on many independent investigations [**Fig. 22].**

But that fact (a warmer MWP) has little relevance to the question of the cause of current warming (if indeed such warming exists). Therefore, when the hockeystick was first published, my attention focused on the fact that Michael Mann's proxy record seemed to stop in 1979 and that the continuing temperature data came entirely from the Jones analysis of surface thermometers. [I think this is the real explanation of "Mike's *Nature* trick," referred to in the Climategate e-mails that speak of "hiding the decline."]

I immediately sent e-mails to Mann and questioned him about this point, asking him why his proxy temperature record suddenly stopped in 1979. I received back a rather brusque reply that no suitable data were available. But I already knew that such data are indeed available [**Figs 23, 24]** and therefore surmised that his proxy data did not show the increase in temperature demanded by the surface thermometers. So he simply terminated his analysis in 1979 to hide this fact (his "*Nature* trick") – in order to be "politically correct" and support the IPCC story of a temperature increase.

The Climategate e-mails make it clear why Mann terminated the Hockeystick in 1979. There is a huge irony here that should be readily apparent. As I maintain above, there was in fact no increase in surface temperatures after 1979, and therefore Mann's (never-published) proxy temperatures are correct. He simply did not have the courage to believe in his own results. To emphasize this point, I show some of the several proxy data in the published literature **[Fig. 25**].

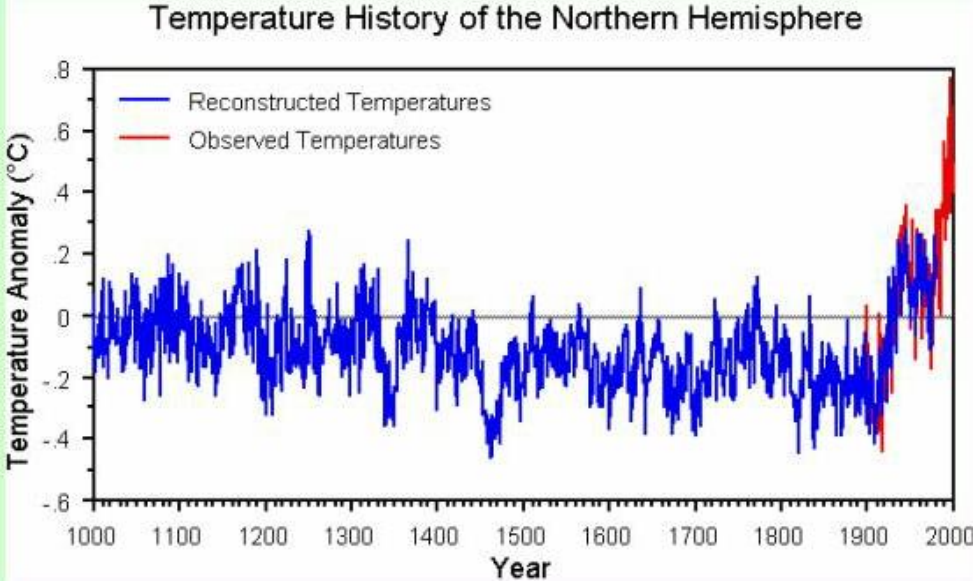

Fig 20: The "Hockeystick" graph [Mann, Bradley, Hughes 1998,1999] has been used to argue that the 20th Century is unusually warm [IPCC-TAR 2001]. The underlying analysis has now been discredited. Independent lines of evidence have restored the LIA (Little Ice Age ~1400-1850AD) and shown a MWP (Medieval Warm Period ~900-1200AD) as being warmer than the present. Note: The "Reconstructed" (proxy-based) Temperatures stop suddenly in 1979 – and are continued by the "Observed" (weather-station thermometer based) Temperatures.

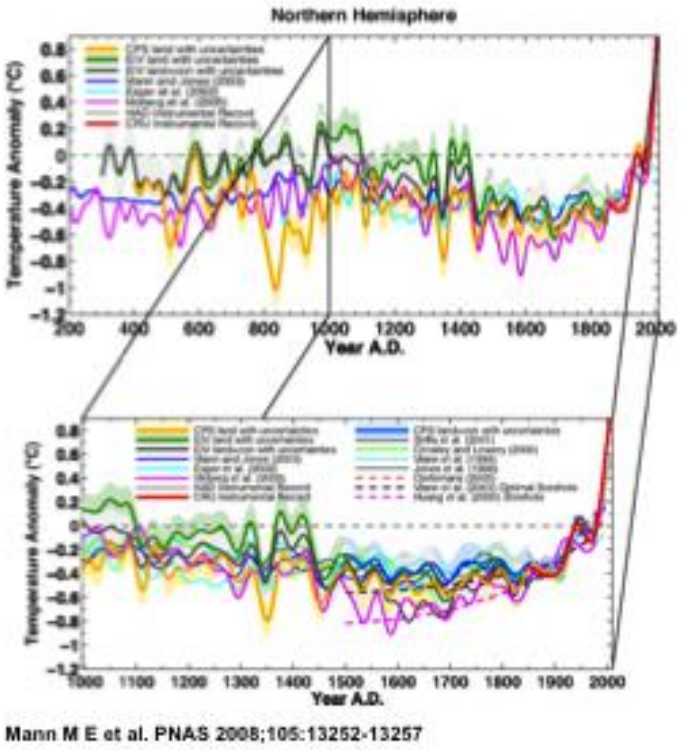

Fig 21: Mann et al [PNAS 2008] have now restored the LIA and MWP. Shown for comparison are published NH reconstructions, centered to have the same mean as the overlapping segment of the CRU instrumental NH land surface temperature record 1850–2006. All series have been smoothed with a 40-year low-pass filter. Confidence intervals have been reduced to account for smoothing."

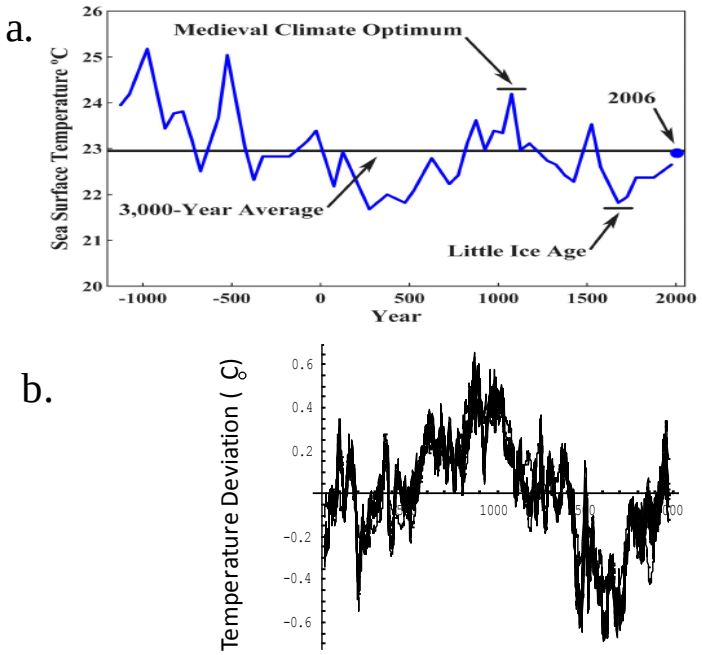

Fig 22: [Fig 3 from NIPCC 2008] (a) SST (mid-Atlantic) from ocean sediment analysis [after Keigwin 1996]. (b) Paleo-temperatures for proxy data (with tree rings eliminated) [Loehle 2007].
Note that the MWP (at ~1000AD) is warmer than the 20th century.

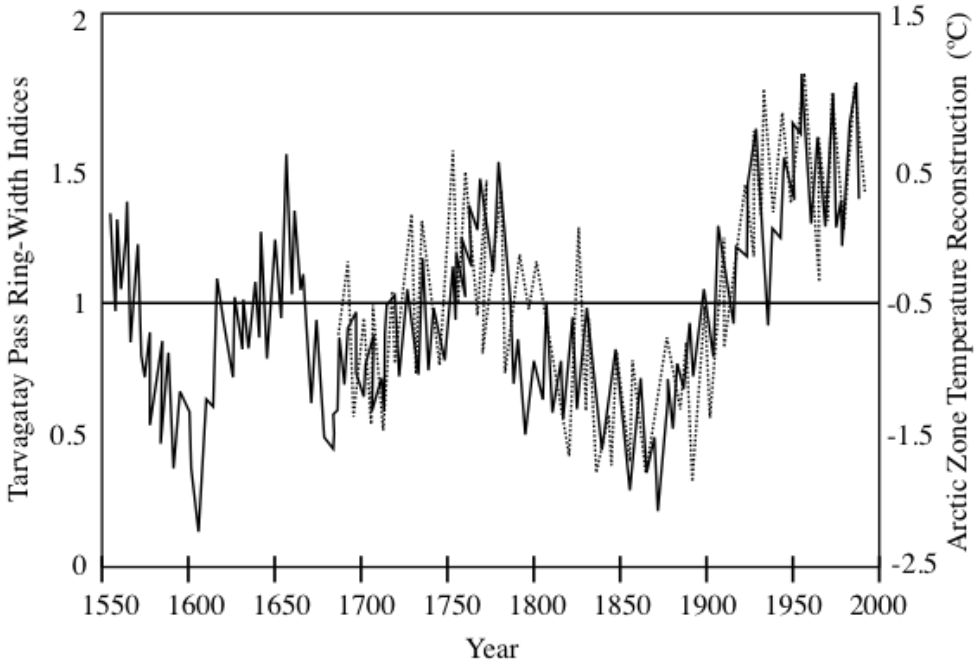

Fig 23: [Fig 16 from HTCS (1997)] Tree-ring data of Jacoby et al [Science 1996], showing no temperature rise after about 1950.

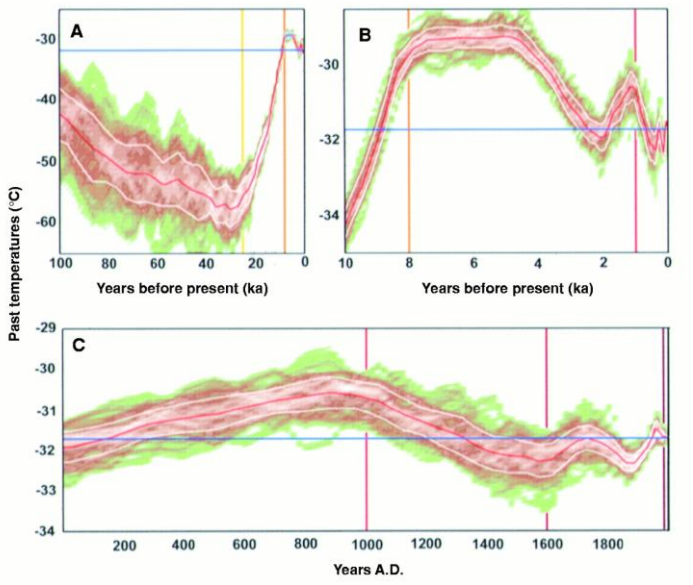

Fig 24: Temperature values from the GRIP ice-core borehole in Greenland. Note the pronounced MWP and LIA [Dahl-Jensen et al *Science* 1999]. The authors state explicitly: no warming is seen after 1940.

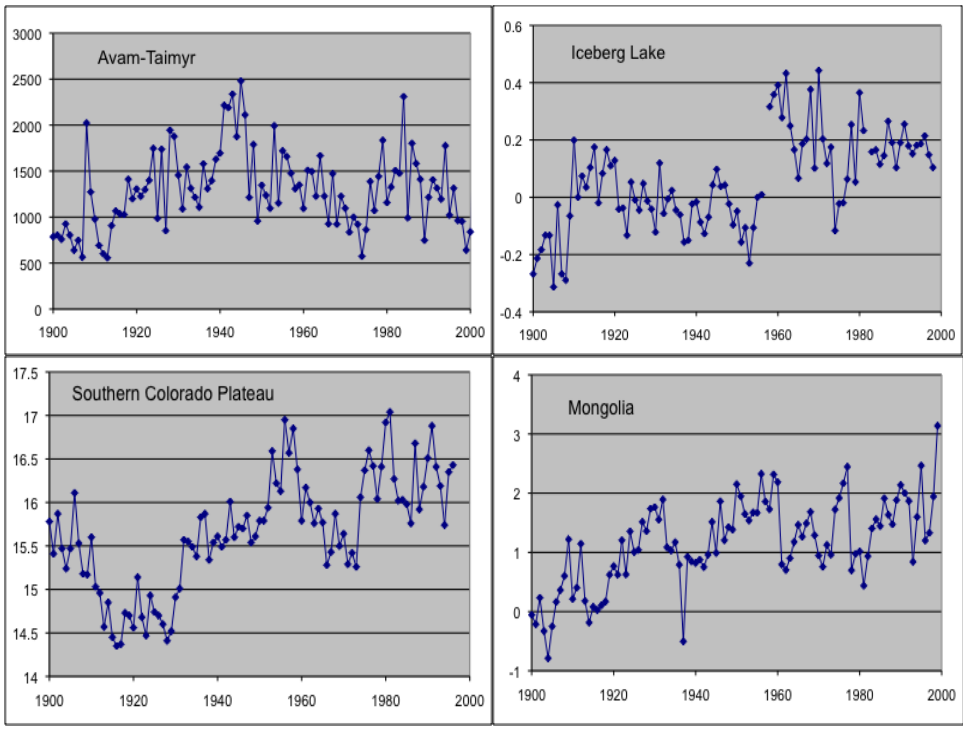

Fig. 25: Recent temperatures from proxy data [courtesy of F C Ljungquist]

A further example [Kaufman et al, Science 235, 4 Sept 2009] shows NO WARMING of post-1979 proxies; however, the smoothed curve in their figure 2 clearly misrepresents the yearly temp record.

Summary of Section 3

The reported (IPCC) surface temperature trend (1979-1997), largely based on the analysis of weather-station thermometers by the CRU of EAU (of "Climategate" fame), is problematic; it is not seen by other observing methods.

Proxy data show no warming after 1979; this is the likely reason Mike Mann stopped his Hockeystick analysis in 1979 ("Mike's *Nature* trick") to "hide the decline" -- i.e, to hide the disparity between proxy temperatures and rapidly rising thermometer temperatures of CRU. [We have yet to learn how CRU selected and then "corrected" weather station data]

Solar Activity: A Major Cause of Decadal –Scale Climate Change

If not anthropogenic, what is the likely cause of climate change of the 20th century? Isotopic data from stalagmites [**Fig. 26**] show a detailed correlation between terrestrial climate parameters and variation in (cloud-forming) cosmic rays, produced by variations in solar activity (particle streams and interplanetary magnetic fields). Note that sunspots and TSI (Total Solar Irradiance) act only as rough indicators of solar activity and are insufficient to produce significant climate effects.

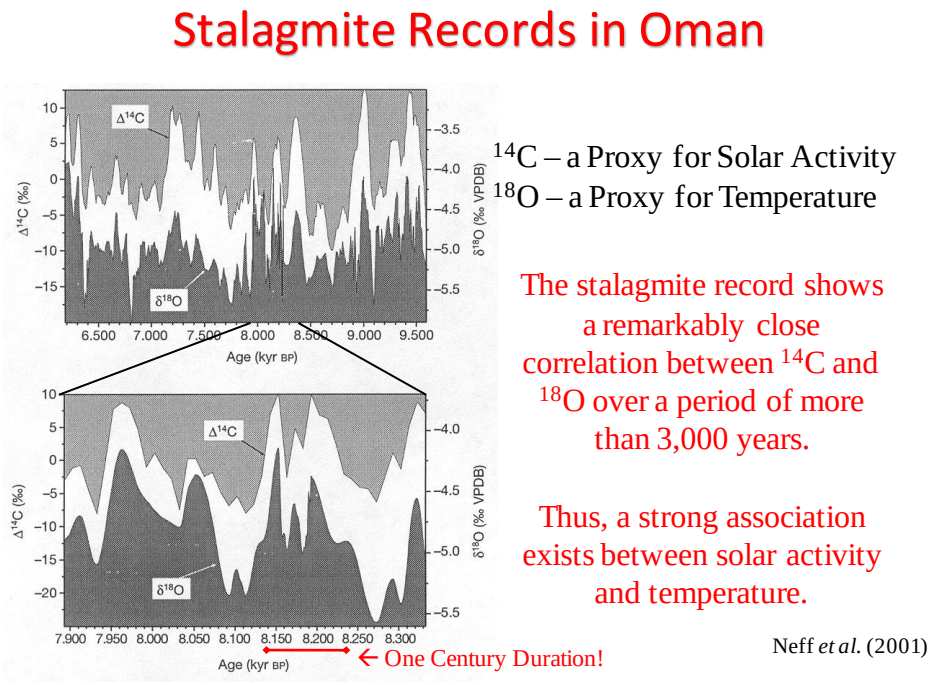

Fig. 26: Relation between cosmic-ray-produced C-14 (Solar Activity) and O-18 (Temperature) of stalagmite layers (from 6500 to 9500 BP). The lower graph shows the central portion (of 400 years length).

A Historical Note

The discrepancy between a reported surface warming (from 1979 onward) and atmospheric trends in the tropics has been evident for about 20 years. See, for example, Fig. 9 in the 1997 book *Hot Talk, Cold Science* [**Fig. 27]**. Why was there no concerted attack on the surface data – even knowing about the Urban Heat Island effect? The disparity between surface and atmospheric temperature trends was investigated by experts in 2000 [**see BOX]** and in the CCSP-1.1 study (2006). Possible explanations: The balloon-radiosonde data from the tropics may have been considered too sparse; the satellite-MSU data were either ignored by IPCC or attacked as incorrect. The proxy data were either ignored or suppressed by politically correct supporters of AGW. It seems that "Climategate" may have been the "dam-buster'' that finally made it possible to throw doubt on the reported surface warming trends.

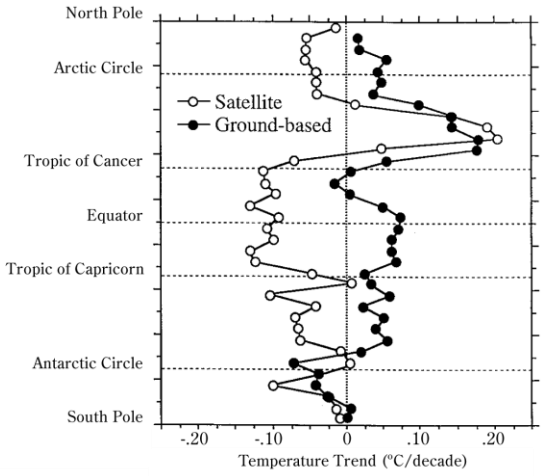

Fig. 27: [HTCS (1997) Fig. 9] Disparity between tropical surface and atmospheric trends, as already indicated by data in 1997. Note: NH warming trend argues against any appreciable cooling by sulfate aerosols.

NAS-NRC Report [2000]: *"Reconciling Observations of Global Temperature Change"*

The NAS-NRC panel (chaired by Prof J M Wallace) failed to "reconcile" the disparity in temperature trends between SURFACE and troposphere --as measured by balloon-borne radiosondes and also by independent Satellite Microwave Sounding Units (MSU). The simplest explanation would be to discard the reported surface trends. Yet the panel preferred the opposite conclusion, disregarding also the "moist adiabatic" adjustment to the lapse rate.

This panel report was followed six years later by the CCSP report SAP-1.1, which compared (in Chapter 5) tropical surface and atmospheric temperature trends with climate models (see Fig.1 and 2) – and noted the obvious disparity. Interestingly, the Executive Summary of the CCSP report (TMG Wigley, lead author) tried to overcome the results of Chapter 5 by focusing on a global comparison and by using an inappropriate metric – "range" rather than "Standard Deviation" -- for the comparison. For details, see Singer [*E&E* 2011].

CONCLUSION

- 1. The US-CCSP report shows major differences between observed temp trends and those from GH models
- These disagreements are confirmed and extended by Douglass *et al* [in IJC 2007] and by NIPCC 2008
- Claims of "consistency'" between models and obs by Santer et al [in IJC 2008] are shown to be spurious
- ***2. IPCC-4 climate models use an insufficient number of runs to overcome "chaotic uncertainty"***
- ***3. We find no evidence for the surface warming trend claimed by IPCC-4 in support of AGW***
- ***We conclude that current warming is mostly natural and that the human contribution is minor.***

Some Outstanding Research Topics

1. **Why do Models and Observed Trends disagree? Climate Sensitivity? Negative Feedback or Saturation?**
2. **What is Causing Climate Change of 20th Century? Solar Activity changes, Internal Oscillations – or a Combination (through Stochastic Resonance)?**
3. **Sea-Level Rise: Understanding its Magnitude. Accelerating – or not?**
4. **Abrupt Climate Change (D-O events in ice cores and CO2 increases)**
5. **Possible Climate Effects of Air Traffic**