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The Cause Of Earth's Climate Change Is The Sun

THE FINGERPRINT OF THE SUN IS ON EARTH'S 160 YEAR TEMPERATURE RECORD, CONTRADICTING IPCC CONCLUSIONS, FINGERPRINTING, & AGW.

by Jeffrey A. Glassman, PhD **April 2010**

Solar Global Warming

THE SUN IS BEHIND IT ALL.

ABSTRACT

Solar energy as modeled over the last three centuries contains patterns that match the full 160 year instrument record of Earth's surface temperature. Earth's surface temperature throughout the modern record is given by

$$T(t) = m_{134}S_{134}(t-\tau) + m_{46}S_{46}(t-\tau) + b \quad (1)$$

where S_n is the increase in Total Solar Irradiance (TSI) measured as the running percentage rise in the trend at every instance in time, t, for the previous n years. The parameters are best fits with the values m_{134}=18.33°C/%, m_{46}=-3.68°C/%, b=13.57(-0.43)°C, and τ=6 years. The value of b in parenthesis gives $T(t)$ as a temperature anomaly. One standard deviation of the error between the equation and the HadCRUT3 data is 0.11°C (about one ordinate interval). Values for a good approximation (σ=0.13°C) with a single solar running trend are m_{134}=17.50°C/%, m_{46}=0, b=13.55(-0.45)°C, and τ=10 years.

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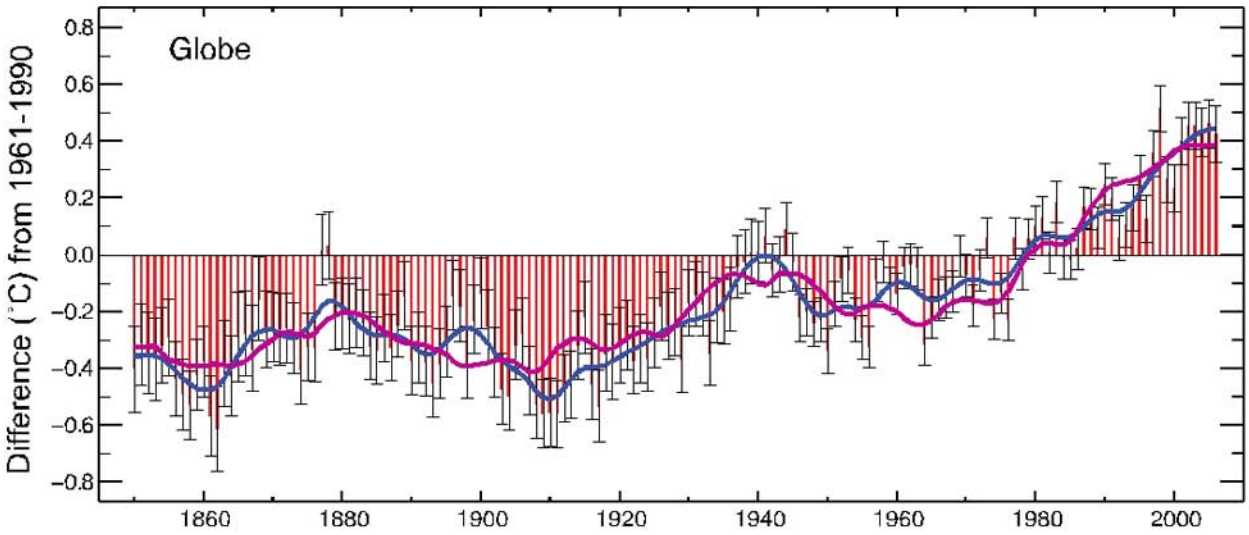

Global average surface temperature with solar formula overlay. The figure is IPCC's AR4 Figure 3.6 from HadCRUT3, with Earth's surface temperature from Equation (1) added in berry color. The new temperature model is a linear combination of two variables. The variables are causal, running trend lines from the solar model of Wang, et al. (2005). IPCC's blue curve is the temperature smoothed by a backward and forward symmetric, non-causal filter.

FIGURE 1

All data for this model are primary data preferred by IPCC in its Reports for solar radiation and for Earth's surface temperature. The solar running trends are elementary, backward-looking (realizable) mathematical trend lines as used by IPCC for the current year temperature, but computed every year for the Sun.

Any variations in the solar radiation model sufficient to affect the short term variability of Earth's climate must be selected and amplified by Earthly processes. This model hypothesizes that cloud albedo produces broadband amplification, using established physical processes. The hypothesis is that while cloud albedo is a powerful, negative feedback to warming in the longer term, it creates a short term, positive feedback to TSI that enables its variations to imprint solar insolation at the surface. A calculation of the linear fit of surface temperature to suitably filtered solar radiation shows the level of amplification necessary to support the model, and isolates the short term positive feedback from the long term negative cloud albedo feedback.

This model hypothesis that the natural responses of Earth to solar radiation produce a selecting mechanism. The model exploits evidence that the ocean dominates Earth's surface temperature, as it does the atmospheric CO2 concentration, through a set of delays in the accumulation and release of heat caused by three dimensional ocean currents. The ocean thus behaves like a tapped delay line, a well-known filtering device found in other fields, such as electronics and acoustics, to amplify or suppress source variations at certain intervals on the scale of decades to centuries. A search with running trend lines, which are first-order, finite-time filters, produced a family of representations of TSI as might be favored by Earth's natural responses. One of these, the 134-year running trend line, bore a strong resemblance to the complete record of instrumented surface temperature, the signal called S_{134}.

Because the fingerprint of solar radiation appears on Earth's surface temperature, that temperature cannot reasonably bear the fingerprint of human activity. IPCC claims that human fingerprint exists by several methods. These include its hockey stick pattern, in which temperature and gas concentrations behave benignly until the onset of the industrial revolution or later, and rise in concert. IPCC claims include that the pattern of atmospheric oxygen depletion corresponds to the burning of fossil fuels in air, and that the pattern of isotopic lightening in atmospheric CO2 corresponds to the increase in CO2 attributed to human activities. This paper shows that each of IPCC's alleged imprints due to human activities is in error.

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The extremely good and simple match of filtered TSI to Earth's complex temperature record tends to validate the model. The cause of global warming is in hand. Conversely, the fact that Earth's temperature pattern appears in solar radiation invalidates Anthropogenic Global Warming (AGW).

I. INTRODUCTION

Earth's climate responds to solar energy dominantly as a mechanical tapped delay line, and so is sympathetic to certain delays in the solar output, to reinforce some but suppress others. This phenomenon occurs first because the atmosphere is a by product of the ocean. The ocean dominates the climate response because it is dark to absorb short wave radiation, because it has a high heat capacity, and because ocean currents cause delays to neutralize or reinforce solar patterns.

The Intergovernmental Panel on Climate Change (IPCC) asks the question, ***"Can the Warming of the 20th Century be Explained by Natural Variability?"*** IPCC's answer can be read as affirmative, but with no more than 10% certainty. AR4, FAQ 9.2, p. 702. IPCC's data on which it relied show that the answer is "Yes" with high confidence, and that the cause of the variability is the Sun. IPCC's own data analysis techniques, applied more frequently and its own preferred data, reveal the patterns, and reveal IPCC's error in computing the radiative forcing of Total Solar Irradiance (TSI).

IPCC's Fatal Errors, the previous paper in the ***Rocket Scientist's Journal***, showed a number of errors within IPCC's Anthropogenic Global Warming Model, each of which was sufficient to invalidate AGW based on internal errors. That paper relied on no new data, nor any alternative in data analysis or modeling by IPCC, but the result was negative with respect to the climate model. This paper relies on IPCC's preferred data expressed in its Reports, but is affirmative, advancing an alternative model for global warming in which the Sun is the cause.

This Solar Global Warming model is a competing model to AGW, based on the same data. It necessarily contradicts several more arguments, claims and derivations made by IPCC. Each is analyzed here.

This paper in part confirms and extends the analysis of Dr. Nicola Scafetta. (See references.) The starting points and end points are similar, but this study adheres to IPCC's data and methods to debunk IPCC's model on its own terms, and to minimize any tendency to produce an alternative and competing climate model from the infinity of possible candidates.

IPCC's modeling is far less mathematical than Scafetta's, and relies on patterns evidenced in graphs rather than computed correlation values. To be sure, either graphical or computational correlation methods can guide the creation of scientific models, but in the end, models must produce fully quantified predictions to compare with scientific facts. The patterns shown and discussed in this paper are exclusively objective.

II. SUN IMPRINT ON EARTH'S TEMPERATURE

A. TEMPERATURE DATA

IPCC has considered an abundance of published temperature records:

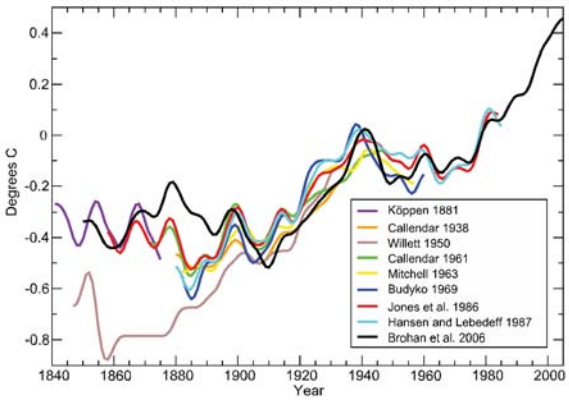

Figure 1.3. Published records of surface temperature change over large regions. Köppen (1881) tropics and temperate latitudes using land air temperature. Callendar (1938) global using land stations. Willett (1950) global using land stations. Callendar (1961) 60°N to 60°S using land stations. Mitchell (1963) global using land stations. Budyko (1969) Northern Hemisphere using land stations and ship reports. Jones et al. (1986a,b) global using land stations. Hansen and Lebedeff (1987) global using land stations. Brohan et al. (2006) global using land air temperature and sea surface temperature data is the longest of the currently updated global temperature time series (Section 3.2). All time series were smoothed using a 13-point filter. The Brohan et al. (2006) time series are anomalies from the 1961 to 1990 mean (°C). Each of the other time series was originally presented as anomalies from the mean temperature of a specific and differing base period. To make them comparable, the other time series have been adjusted to have the mean of their last 30 years identical to that same period in the Brohan et al. (2006) anomaly time series. AR4 Figure 1.3, p. 101.

FIGURE 2

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Of IPCC's sources, the Brohan record, identified as HadCRUT3, is the longest and broadest, and serves as IPCC's standard. That source also provides a graph of annual temperatures:

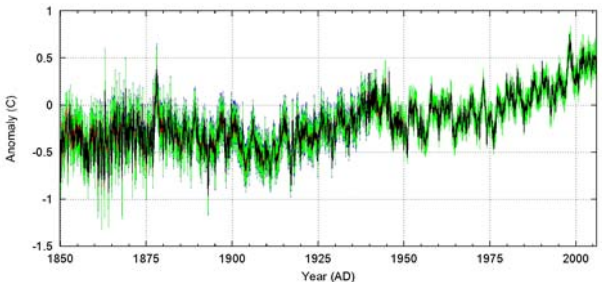
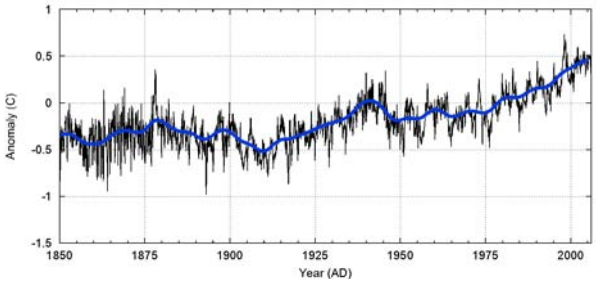


Figure 10: HadCRUT3 global temperature anomaly time-series (C) at monthly (top)... resolutions. The solid black line is the best estimate value, the red band gives the 95% uncertainty range caused by station, sampling and measurement errors; the green band adds the 95% error range due to limited coverage; and the blue band adds the 95% error range due to bias errors. Brohan, P., et al., "Uncertainty estimates in regional and global observed temperature changes: a new dataset from 1850", 12/19/05, p. 18.

FIGURE 3

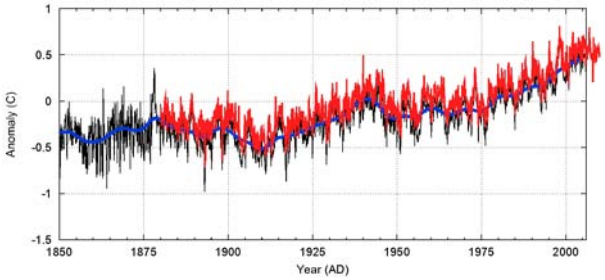
The Brohan record is next with the error bands removed, and IPCC's 11-year smoothed trace superimposed in blue:



Brohan GAST, error bands removed, and IPCC's 11 year smooth trace superimposed.

FIGURE 4

The Brohan record is similar to the NOAA monthly record, shown overlaid next in red:

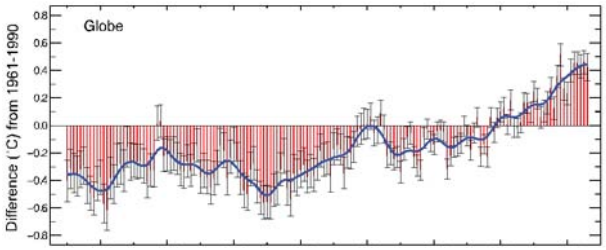


NOAA Temperature Record Superimposed on Brohan.

FIGURE 5

IPCC separately provides the global temperature series, taken from Brohan and shown next:

Figure 3.6: Global ... annual combined land-surface air



temperature and SST anomalies (°C) (red) for 1850 to 2006 relative to the 1961 to 1990 mean, along with 5 to 95% error bar ranges, from HadCRUT3 (adapted from Brohan et al., 2006). The smooth blue curves show decadal variations (see Appendix 3.A). AR4 ¶3.2.2.4 Land and Sea Combined Temperature: Global (Northern Hemisphere, Southern Hemisphere and Zonal Means deleted), p. 249.

FIGURE 6

IPCC uses variations of the global surface temperature to make its forecasts. The next figure contains several examples. Note that the differences in the anomaly zero points, 1961-1990 vs. 1980-1999.

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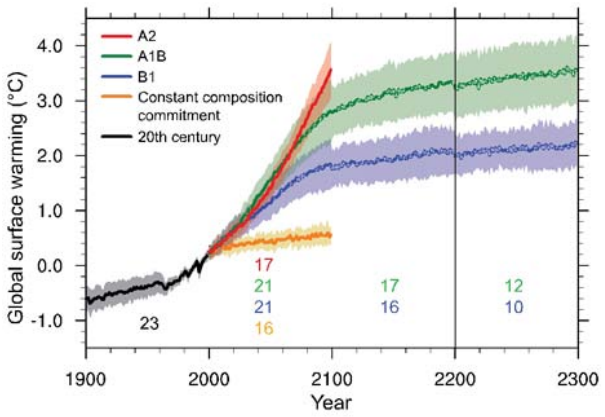
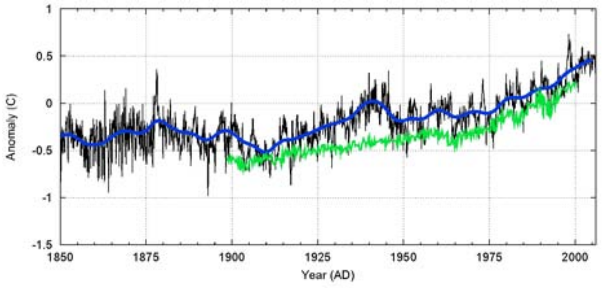


Figure 10.4. Multi-model means of surface warming (relative to 1980–1999) for the scenarios A2, A1B and B1, shown as continuations of the 20th-century simulation. Values beyond 2100 are for the stabilisation scenarios (see Section 10.7). Linear trends from the corresponding control runs have been removed from these time series. Lines show the multi-model means, shading denotes the ±1 standard deviation range of individual model annual means. Discontinuities between different periods have no physical meaning and are caused by the fact that the number of models that have run a given scenario is different for each period and scenario, as indicated by the coloured numbers given for each period and scenario at the bottom of the panel. For the same reason, uncertainty across scenarios should not be interpreted from this figure (see Section 10.5.4.6 for uncertainty estimates). AR4, ¶10.3 Projected Changes in the Physical Climate System, p. 762.

FIGURE 7

Adjusting for the difference in the zero points, the average temperature record used in the simulations overlays the global HadCRUT3 series in the later years and in 1900, but the simulation average is missing the temporary warming feature centered in 1940. The simulation average temperature record is shown as the green overlay in the next figure.



Simulations superimposed on Brohan Record.

FIGURE 8

IPCC, it would seem, only requires its models have the correct amplitude and slope at the end point of the current temperature. This is reinforced by considering IPCC's radiative forcing paradigm in which a response to added forcings is linearly added to the previous climate history. However, this study depends on the shape of the temperature history.

B. SOLAR IRRADIANCE DATA

IPCC provides the following chart for the history of solar radiation:

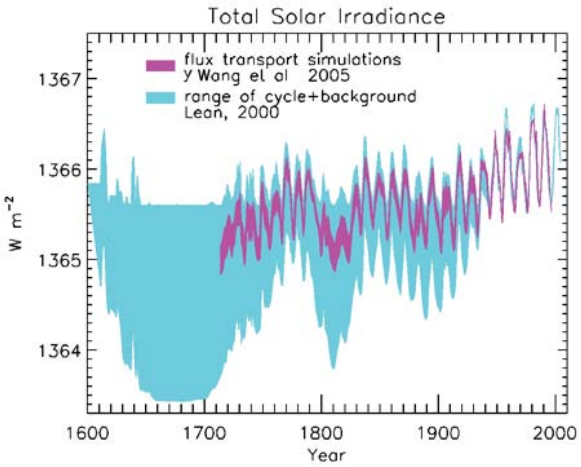


Figure 2.17. Reconstructions of the total solar irradiance time series starting as early as 1600. The upper envelope of the shaded regions shows irradiance variations arising from the 11-year activity cycle. The lower envelope is the total irradiance reconstructed by Lean (2000), in which the long-term trend was inferred from brightness changes in Sun-like stars. In comparison, the recent reconstruction of Y. Wang et al. (2005) is based on solar considerations alone, using a flux transport model to simulate the long-term evolution of the closed flux that generates bright faculae. AR4 ¶2.7.1.2.1.1 Reconstructions of past variations in solar irradiance, p. 190.

FIGURE 9

The references are to the journal paper Wang, Y.-M., J.L. Lean, and N.R. Sheeley, Jr., *Modeling the Sun's Magnetic Field and Irradiance since 1713*, Astrto.J., 625:522-538, 5/20/05 (Wang, et al. (2005)) and to the journal letter, Lean, J.L., *Evolution of the Sun's Spectral Irradiance Since the Maunder Minimum*, Geophs.Res.Ltrs, V. 27, No. 16, pp. 2425-2428, 8/15/00 (Lean (2000)). Peculiarly but more informatively, Wang et al. (2005) sports a second title on each page: *Secular Evolution of the Sun's Magnetic Field*.

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IPCC's reconstruction is lifted from the following chart in Wang:

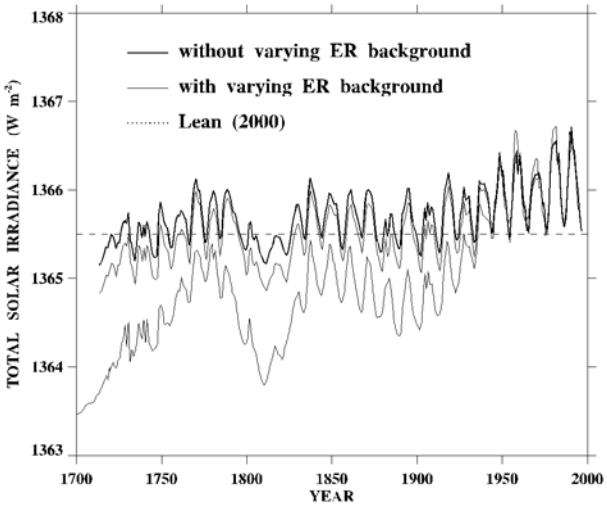

Fig. 15.—Variation of yearly TSI from 1713 to 1996, derived from model (S1+S2)/2 without (thick solid curve) and with (thin solid curve) a secularly varying ephemeral region background. For comparison, the reconstruction of Lean (2000) is indicated by the dotted curve, while the present-day "quiet-Sun" TSI level (IQ = 1365.5 Wm^{-2}) is marked by the dashed line. Wang, et al. (2005), p. 535.

FIGURE 10

Note: ER stands for Ephemeral Regions (ER), which Wang et al. define as external magnetic fields comprising "*small dipoles*" that are "*very short-lived and essentially represent a small-scale background noise*", as distinct from the large dipoles or active regions in the sunspot latitudes.

The violet line in Figure 9 (AR4 Figure 2.17) is a thick, painted region bounded by the upper pair of curves from Wang. The blue region in that figure is a similarly filled region bounded by two curves. IPCC's lower bound is Wang's lower curve, as originally published in Lean (2000), but extended and reduced about 0.97 Wm^{-2} and more in the 20th Century to as much as 1.6 Wm^{-2}:

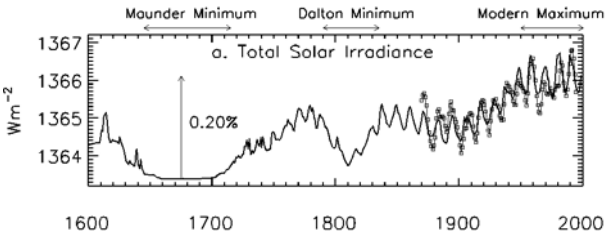

Figure 4a. [A]nnual total irradiance ... . symbols ... are estimates of total irradiance (scaled by 0.999) determined independently by Lockwood and Stamper [1999]. Lean, J., (2000), p. 2427.

FIGURE 11

The upper bound in blue in IPCC's Figure 2.17 (Figure 9) is the upper curve from IPCC's Third Assessment Report, shown below, shifted down by an average of 5.7 Wm^{-2} and more in the 20th Century. TAR, Figure 6.5, p. 382, attributed to Lean et al. (1995):

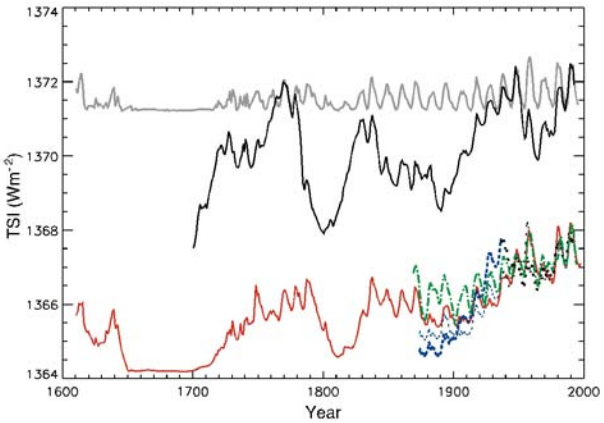

Figure 6.5: Reconstructions of total solar irradiance (TSI) by Lean et al. (1995, solid red curve), Hoyt and Schatten (1993, data updated by the authors to 1999, solid black curve), Solanki and Fligge (1998, dotted blue curves), and Lockwood and Stamper (1999, heavy dashdot green curve); the grey curve shows group sunspot numbers (Hoyt and Schatten, 1998) scaled to Nimbus-7 observations for 1979 to 1993. TAR, ¶6.11.1.2 Reconstructions of past variations of total solar irradiance, p. 382.

FIGURE 12

IPCC provides little if any explanation for its preparation of the Total Solar Irradiance model in its Figure 2.17. Lean (2000) introduces her letter by saying,

> *Variations in the irradiance of the Sun during past centuries may influence Earth's climate in ways that amplify or mitigate anthropogenic impacts.* Id., p. 2425.

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and later,

> *Since direct irradiance observations exist for only two decades and in limited spectral regions, estimating historical solar spectral irradiance involves speculations and assumptions.* Id., p. 2427.

She makes no further references to anthropogenic effects, so how much her speculations and assumptions might have been a bias to show that the Sun amplifies or mitigates anthropogenic global warming (AGW) can be only a matter of additional speculation. However, Lean was a lead author on IPCC's Fourth Assessment Report and a contributing author and reviewer on the Third, reports intended to establish the existence and the threat to humanity of AGW. Wang, et al. (2005) has no references to anthropogenics of any type, and while Wang apparently has had no direct association with IPCC, his co-author on the second source was IPCC author Lean. Wang's model did reduce Lean's estimate of the Sun's radiance and the solar forcing by increase by a factor of 2.4, as noted by IPCC:

> *From 1750 to the present there was a net 0.05% increase in total solar irradiance, according to the 11-year smoothed total solar irradiance time series of Y. Wang et al. (2005), shown in Figure 2.17. This corresponds to an RF of +0.12 Wm^{-2}, which is more than a factor of two less than the solar RF estimate in the TAR, also from 1750 to the present. Using the Lean (2000) reconstruction (the lower envelope in Figure 2.17) as an upper limit, there is a 0.12% irradiance increase since 1750, for which the RF is +0.3 Wm^{-2}.* IPCC, AR4 ¶2.7.1.2.2 *Implications for solar radiative forcing,* p. 192.

Consequently the Wang model is substantially superior to the Lean model for demonstrating that the greenhouse effect and CO2 not only cause global warming, but that they are a threat.

The observation in Lean (2000) is still valid: no empirical evidence exists beyond a few decades to compare the accuracy of these models. Regardless, the modeling in Wang et al. (2005) is a substantial improvement in rigor. They divided the Sun's surface in two: an active region comprising the sunspots and faculae, plus a separable ephemeral or background region. They represented the active region by as many as 600 large, closed loop dipoles, called Bipolar Magnetic Regions (BMRs), randomly placed over the sphere. They matched the resulting magnetic field to the annual sunspot number, the polarity switching phenomenon, and the solar wind aa index. They also adopted empirical relationships from the literature, and substantially reduced the facular background used in Lean (2000).

Wang, et al. recognize that their secular (background) trend is substantially smaller than found in previous models. However they make no claim that their model is more accurate beyond accounting for implications from an arbitrary scaling of the aa index, recorded since 1868, and empirical relationships involving the index. While any model of sophistication would agree with modern measurements, the question is how well a model represents the evolution of the Sun's irradiance to the present, as Wang, et al. stated at the outset was their objective. While the absolute value of the trend remains relatively uncertain, the Wang model represents the state-of-the-art in representing solar irradiance, optimum to account for the fine structure of TSI variability because it is an emulation of physical phenomena, constrained by the long records of sunspot numbers and the solar wind.

The Total Solar Irradiance used in this paper is the Wang et al. (2005) model, digitized from the violet trace in IPCC's Figure 2.17.

C. DATA ANALYSIS METHODS

Finding patterns is the essence of scientific discovery, leading to assumptions about cause and effect for modeling. Coherence and cross-correlation are two mathematical methods found in the literature for quantifying the similarity between two records. The coherence function is the cross-spectral density normalized by the product of the standard deviations of the individual processes. Empirically, the coherence function is problematic because it includes estimates of noisy processes in the denominator, making it an unstable statistic. The word *coherent* in this paper is to mean the appearance of a pattern with attributes similar to those known to be due to a signal or to a common source in noise (e.g., *"coherent patterns of statistically significant trends"*, AR4 ¶3.8.2.2, p. 302), and *incoherent* to mean having the attributes of a pattern due to noise alone.

Correlation appears in the literature most often as a single point calculation, but the cross-correlation function is essential to establish leads and lags. It is the point correlation with one record shifted with respect to the other by a variable amount. The cross-correlation function is the method by which CO2 is known to be the effect of temperature and not its cause in the Vostok record. See ***The Acquittal of Carbon Dioxide*** in the ***Rocket Scientist's Journal***.

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Cross-correlation generally requires detrending of records to remove the mean, and where, as here, a substantial and perhaps significant trend exists in the means of both the candidate cause and the candidate effect, the prospects for intensive and esoteric computations are not promising.

Spectral analysis and principal component analysis (PCA) are cross-correlation methods. In these techniques, a data record is cross-correlated not with another record, but with a set of mutually uncorrelated functions to decompose the record into a scalar sum of the components. In spectral analysis, sinusoids provide a standard set of component functions. In PCA, the investigator chooses the functions to use, the first being arbitrary, and the subsequent functions residue functions, forced to be uncorrelated with each of the preceding functions.

Spectral analysis is not particularly helpful in the climate problem. While the solar intensity model appears to have a powerful sinusoidal signal from the solar cycle, the cycle is irregular, varying between 9 and 13 years. AR4, Glossary, p. 952. This irregularity creates a broad response around the center period of about 10.5 to 11 years instead of producing a single line and a single coefficient.

Even more important is that beyond the average power contributed, the 11-year cycle is noise to climate. The temperature record appears to contain no 11 year component, and in fact 11-years is marginally too short with respect to climate so it would tend to be classified as weather.

D. REPRESENTING SIGNAL SOURCES ACCORDING TO RECEIVER RESPONSES

Sinusoids are important in electromagnetics because the sources and receptors are molecular oscillators that naturally produce or resonate to sinusoids. These arise in climate with respect to measuring solar activity by the calcium molecule lines I and II, and again in atmospheric absorption spectra due to molecules of water vapor, CO2, and the other greenhouse gases.

Sinusoids are also important in electrical and mechanical systems because of what is called simple harmonic motion, a process in which energy alternates between kinetic and potential forms at natural frequencies. This does not exist in thermodynamic systems because, while heat can be converted and stored, it has no kinetic form. That is, heat lacks inertia, and when inertia is used in climate jargon, it signifies heat capacity. These considerations go to the heart of the modeling problem: a clue to how one might profitably decompose a candidate source of energy lies into characteristic responses of the receptor. The receiver favors or rejects certain forms of input, so decomposing the source in similar forms can be a fruitful pursuit.

Electrical and mechanical systems can also be tuned without inductors by delay lines. Narrowband, high-pass and low-pass reactions produced by tapped delay lines are common in the literature, although the utility of such filters is often limited by the challenge in designing long, low loss delay lines. However, in the case of climate, the ocean provides short to extremely long delay lines by subsurface absorption and deep water circulation patterns such as the Thermohaline Circulation, better called the "conveyor belt", and the Gulf Stream. The observed common pattern between the Sun and Earth's temperature leads to the conjecture that these oceanic phenomena tune Earth's climate to prefer some lag times and reject others within solar radiation.

The hypothesis tested here is whether the Sun is responsible for the observed climate variability. In the climate problem, the primary concern is the global average surface temperature (GAST). It is of special interest on the scale of a few centuries because of the span of available scientific measurements, and because of the conjecture that man has influenced climate during the industrial age. Furthermore, the record shows no obvious sensitivities on the scale of the solar cycle, either at 11 years or 22 years.

E. IPCC INTERPRETS ITS CHARTER TO DEFEND MANMADE CLIMATE CHANGES.

The United Nations Environment Programme (UNEP) says,

> *The IPCC was established by UNEP and WMO* [World Meteorological Organization] *in 1988 to assess the state of existing knowledge about climate change: its science, the environmental, economic and social impacts and possible response strategies.* http://www.unep.org/Documents.Multilingual/Default.asp?DocumentID=43&ArticleID=206&l=en .

Instead, IPCC understands its charter to be

> *to assess on a comprehensive, objective, open and transparent basis the scientific, technical and socio-economic information relevant to understanding the scientific basis of risk of* ***human-induced climate change****, its potential impacts and options for*

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> *adaptation and mitigation.* Bold added, *Principles Governing IPCC Work,* 10/1/1998.

In its first decade, IPCC inserted the assumption that "*human-induced climate change*" exists, and so elevated that conjecture above "*comprehensive, objective, open and transparent*" investigation.

Accordingly, IPCC implements its model, committed to the radiative forcing paradigm, in a number of individual global climate models, selected and tuned by IPCC for agreement with its conjecture that Earth's climate must be caused by man through his CO2 emissions. By application of that flawed and biased model, IPCC determined that the Sun is not the cause of Earth's climate variability.

IPCC claims to stimulate science, not actually to do science, but to define the problem and then to rely on the "*best available science*", meaning that agreeable science published in peer-reviewed publications. AR4, ¶1.2 *The Nature of Earth Science*, p. 95, below. However, its investigators indicate that they accept as peer-reviewed only material from journals which publish no articles skeptical about anthropogenic climate change. The investigators reject other journals and other media, and boycott, intimidate, or ridicule editors and sources not in the camp.

At the same time, the recent Himalayan glacier incident demonstrates the willingness of IPCC to rely on a student paper, based solely on that paper's favorable support of IPCC's conjecture.

IPCC has influenced genuine papers that have negligible bearing on the anthropogenic conjecture to be salted with immaterial phrases to acknowledge dutifully the significance of anthropogenic global warming, and to reference immaterial or biased papers that form a network for a belief system. So IPCC has isolated its work from scientists who respect the virtue of skepticism, from public criticism, and from the review of its superiors in science.

F. IPCC OMITS CLOUD ALBEDO

IPCC's resulting climate model, reflected in the GCMs, is open loop with respect to Bond albedo, the total shortwave reflectance of Earth. The simplest of computations show planetary albedo due to the hydrological cycle to be the overwhelming negative feedback in climate. Cloud albedo stabilizes Earth in its warm state, and surface albedo from ice and snow locks Earth into its cold state ("*cold glacial times and ... warm interglacials*", AR4 FAQ 6.2, p. 465). Cloud albedo mitigates warming from any cause, and because of its power it is unfriendly to the greenhouse effect.

> *Water vapour changes represent the largest feedback affecting climate sensitivity and are now better understood than in the TAR. Cloud feedbacks remain the largest source of uncertainty.* AR4 *Summary for Policymakers,* p. 12.

> *Water vapour is the most important greenhouse gas... .* AR4, FAQ 1.3 *What is the Greenhouse Effect?* p. 115.

> *[A] warmer atmosphere contains more water vapour.* AR4, FAQ 2.1 *How do Human Activities Contribute to Climate Change and How do They Compare with Natural Influences?,* p. 135.

> *In many climate models, details in the representation of clouds can substantially affect the model estimates of cloud feedback and climate sensitivity. Moreover, the spread of climate sensitivity estimates among current models arises primarily from inter-model differences in cloud feedbacks.* ***Therefore, cloud feedbacks remain the largest source of uncertainty in climate sensitivity estimates.*** Citations deleted, bold added, AR4, ¶8.6.3.2 *Clouds*, p. 636.

> ***The response of cloud cover to increasing greenhouse gases currently represents the largest uncertainty in model predictions of climate sensitivity.*** Citation deleted, bold added, 4AR, ¶3.4.3 *Clouds,* p. 275.

and

> *Other human causes of stratospheric water vapour change are unquantified and have a very low level of scientific understanding.* AR4 ¶2.3.7 *Stratospheric Water Vapour,* p. 152.

By specifying only that *human causes* have a very low level of understanding, IPCC implies that natural causes of stratospheric water vapor are better known. All IPCC had to do was subtract the natural causes from the total stratospheric water vapor, and the human part would have been immediately quantified. It didn't do that because neither part is quantifiable, even if an estimate might exist for the total. IPCC says the effects of water vapor are "*better understood*" since the TAR. Its table of scientific understanding for radiative forcing places stratospheric water vapor from methane and the water vapor effects in

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response to aerosols at *"low"*, the lowest level in the table. AR4 *Summary for Policymakers*, Figure SMP.2, p. 4.

> *Additional forcing factors not included here are considered to have a very low LOSU [Level Of Scientific Understanding].* Id.

IPCC not only omits albedo from its table of what it knows, but from its models. Because it is unable to model cloud cover, IPCC parameterizes it:

> *Current GCMs simulate clouds through various complex parametrizations to produce cloud cover quantified by an area fraction within each grid square and each atmospheric layer.* Citation deleted, AR4, ¶ 10.3.2.2 *Cloud and Diurnal Cycle*, p. 767.

IPCC Reports include a well-developed theory of specific cloud albedo, a reflectance per unit area, but fails to multiply that specific albedo by the variable total cloud cover. The result is the models replace any emulation of the dynamic albedo mechanism with a static statistic.

G. SIMULATING CLOUD ALBEDO

Cloud albedo dominates surface albedo by its magnitude and its location, and by eclipsing surface reflectance and absorbance.

> *This cannot be regarded as a surprise: that the sensitivity of the Earth's climate to changing atmospheric greenhouse gas concentrations must depend strongly on cloud feedbacks can be illustrated on the simplest theoretical grounds, using data that have been available for a long time. Satellite measurements have indeed provided meaningful estimates of Earth's radiation budget since the early 1970s (Vonder Haar and Suomi, 1971). Clouds, which cover about 60% of the Earth's surface, are responsible for up to two-thirds of the planetary albedo, which is about 30%. An albedo decrease of only 1%, bringing the Earth's albedo from 30% to 29%, would cause an increase in the black-body radiative equilibrium temperature of about 1°C, a highly significant value, roughly equivalent to the direct radiative effect of a doubling of the atmospheric CO2 concentration.* 4AR, ¶1.5.2 *Model Clouds and Climate Sensitivity*, p. 114.

IPCC admits that cloud cover, and hence cloud albedo and Bond albedo, is known to be dependent on specific humidity and the availability of cloud condensation nuclei (CCN). That humidity is further admitted by IPCC to be dependent on surface temperature, completing a negative feedback mechanism omitted from its GCMs.

Svensmark postulated that galactic cosmic rays supply a significant number of CCNs, and further that the solar wind modulates GCR intensity. In his model, increased solar activity causes warming by sweeping away GCRs and hence CCNs to decrease cloud cover. It is supported by some evidence that cloud cover is negatively correlated with solar activity. IPCC rejected the Svensmark model:

> *We conclude that mechanisms for the amplification of solar forcing are not well established. ... At present there is insufficient evidence to confirm that cloud cover responds to solar variability.* TAR ¶6.11.2.2 *Cosmic rays and clouds*, p. 385.

IPCC thus dismissed the Svensmark GCR model, only to leave its models accounting neither for cloud cover variability nor the correlation between GCRs and cloud cover.

While the results of this paper are consistent with the GCR model, they suggest yet another hypothesis: cloud cover, and hence Bond albedo, is dependent on shortwave radiant absorption and warming at cloud level. At one point in its Reports, IPCC touches on a link between shortwave (solar) radiation and cloud cover. It says,

> *The nature of the response and the forcing-response relation (Equation 6.1)* [the **Climate Sensitivity Parameter**] *could depend critically on the vertical structure of the forcing (see WMO, 1999). A case in point is O_3 changes, since this initiates a vertically inhomogeneous forcing owing to differing characteristics of the solar and long-wave components (WMO, 1992). Another type of forcing is that due to absorbing aerosols in the troposphere (Kondratyev, 1999). In this instance, the surface experiences a deficit while the **atmosphere gains short-wave radiative energy**. Hansen et al. (1997a) show that, for both these special types of forcing, if the perturbation occurs close to the surface, complex feedbacks involving lapse rate and **cloudiness** could alter the climate sensitivity substantially from that prevailing for a similar magnitude of perturbation imposed at other altitudes.* Bold added, TAR ¶6.2.1 p. 356.

IPCC's models never develop dynamic cloudiness. Furthermore, its qualifications to the altitude of the effects are irrelevant. Total albedo is the important parameter, regardless of how it might be shuffled within the atmosphere and between it and the surface. What

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counts first is the extent of cloud cover, and not its various altitudes. And what counts are its statistics, its macroparameter effect on the global average albedo.

As IPCC shows from Kiehl and Trenberth (1997), 20% of incoming solar radiation, almost as much as is reflected back into space, is absorbed by the atmosphere. AR4 FAQ Figure 1.1, p. 96, shown modified below. That shortwave absorption will warm the atmosphere and tend to reduce cloud cover. In brief, and from multiple possible causes, Earth responds to the Sun in part through increased solar activity decreasing cloud cover. All the elements of this model are represented in the GCMs or IPCC's supporting theory, but the Panel has yet to connect them and to activate them. The time has passed to introduce Kiehl & Trenberth v. 2.0:

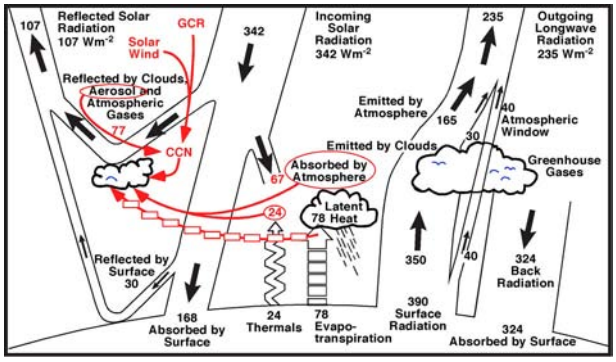

Figure 1.2: The Earth's annual and global mean energy balance, modified. TAR, p. 90.

FIGURE 13

In this revision to the initial model for climate, available CCN and specific humidity combine to form clouds, dependent on the temperature at altitude. The model allows for the Svensmark effect, and links total solar activity directly and indirectly to the extent of cloud cover.

As a result of its selective and incomplete modeling, IPCC determined, with an admittedly low level of scientific understanding, that solar radiation is insignificant compared to its chartered model. Using its ambiguous standard of radiative forcing (RF), IPCC calculates that the RF from the Sun is 0.12 [0.06 to 0.30] Wm^{-2}, only 7% of the 1.66 [1.49 to 1.83] Wm^{-2} it attributes to CO2 (AR4, Figure TS.5, p. 32), all based on a constant Bond albedo. IPCC puts the total solar RF at a third of just the uncertainty in CO2 forcing. That figure of 0.12 Wm^{-2} approximates the best fit linear increase in solar radiation since 1750 using the model of Wang, et al. (2005), but after applying 11-year smoothing. *Id*., ¶2.7.1.2.2, above. In a popular spread sheet, the best fit straight line is the trend, a lexographically efficient synonym adopted here.

Why did IPCC first apply 11-year smoothing, and then model the Sun by a single trend covering almost twice the span of temperature measurements? The answer to the smoothing question is that Earth does not respond to the 11-year cycle. That large component dominating the solar pattern is noise with respect to climate, and it masks underlying patterns. IPCC chose the 250 year trend to minimize any pattern in the solar output, thus reinforcing its conjecture that CO2 is the cause global warming. It is the illusionary handle of a hockey stick.

Conversely IPCC created those Earthly hockey stick patterns to support its thesis. IPCC's transcending argument is that if multiple records are similarly unprecedented, then they must have a common cause; and if any one of them is arguably manmade, then all must be. Applied to the Sun, IPCC urges that the current solar irradiance is not unprecedented, being within 0.05% of its level just 250 years ago. Therefore, IPCC concludes the Sun is not among the parameters with a common cause, and so it ruled out the Sun as a cause.

IPCC says,

> *... the solid Earth acts as a low-pass filter on downward propagating temperature signals... .* AR4, ¶6.6.1.2 *What Do Large-Scale Temperature Histories from Subsurface Temperature Measurements Show?,* p. 474.

and with regard to the gaseous Earth it says,

> *As early as 1910, Abbot believed that he had detected a downward trend in TSI that coincided with a general cooling of climate. The solar cycle variation in irradiance corresponds to an 11-year cycle in radiative forcing which varies by about 0.2 Wm^{-2}. There is increasingly reliable evidence of its influence on atmospheric temperatures and circulations, particularly in the higher atmosphere. Calculations with three-dimensional models suggest that the changes in solar radiation could cause surface temperature changes of the order of a few tenths of a degree Celsius.* Citations deleted, AR4, ¶1.4.3 *Solar Variability and the Total Solar Irradiance*, p. 107.

If the Sun had no effect on albedo, or any other amplifying process, IPCC's calculation would put to rest any

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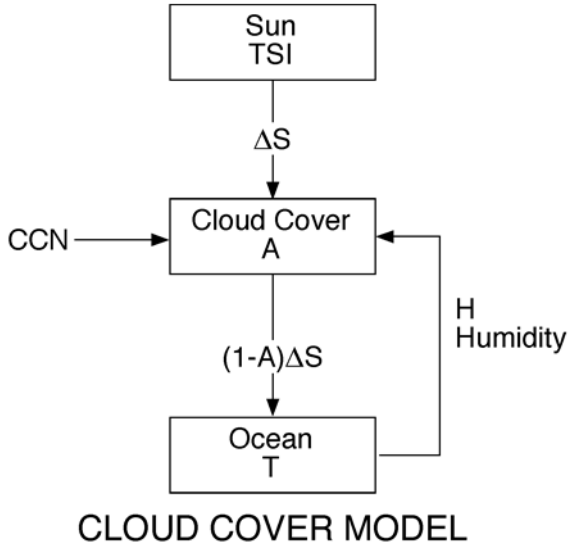
consideration that solar variability might be the cause of the modern temperature variations. IPCC's mistake is to abandon consideration of the Sun as the instrument of climate change based on its first-order forcing calculation with everything else held constant. Albedo, for example, is not constant.

H. ALBEDO DEPENDENCE ON SOLAR RADIATION & HUMIDITY

Cloud albedo is a positive feedback that amplifies solar radiation while at the same time it is a negative feedback that mitigates warming from any cause. Increased solar activity initially causes more shortwave energy to be absorbed in the atmosphere. This warms the atmosphere, reducing cloud cover at a constant humidity, and thus increasing insolation at the surface. Only later does the resulting warming of the surface increases humidity as the ocean absorbs the higher insolation. The ocean is both the primary agent and a slow agent because of its high heat capacity. The increased humidity increases cloud cover, provided a surplus of cloud condensation nuclei is available, increasing cloud albedo, and mitigating the entire effect. The concept is in this illustration:



Linear, first order model for solar radiation and humidity dependent cloud albedo.

FIGURE 14

The steady state effects are seen by examining the first order changes in Albedo, A, Humidity, H, and surface temperature, T, here attributed to the Ocean. Representing the terms by small changes near their nominal values, produces the following linear values, where $k_i \geq 0$:

$$H = H_0 + k_O(T - T_0) \tag{2}$$

$$\begin{aligned} A &= A_0 + k_H \Delta H - k_S \Delta S \\ &= A_0 + k_H k_O (T - T_O) - k_S \Delta S \end{aligned} \tag{3}$$

and

$$T = T_0 + k_T (1 = A)\, \Delta S \tag{4}$$

$$A = \frac{A_0 + (k_H k_O k_T - k_S)\, \Delta S}{1 + k_H k_O k_T \Delta S} \tag{5}$$

$$T = \frac{T_0 + k_T (1 - A_0) \Delta S + k_T k_S \Delta S^2}{1 + k_H k_O k_T \Delta S} \tag{6}$$

$$y = \frac{a + bx + cx^2}{1 + dx} \tag{7}$$

with the obvious substitutions, then expand in a power series for $dx < 1$, as

$$\begin{aligned} y &= (a + bx + cx^2)(1 - dx + d_2 x^2 - d_3 x^3 + \ldots) \\ &= y_0 + y_1 x + y^2 + y_3 x^3 + \ldots \end{aligned} \tag{8}$$

where

$$y_0 = a \tag{9}$$

$$y_1 = b - ad \tag{10}$$

$$y_2 = c - (b - ad)d \tag{11}$$

and

$$y_n = -y_{n-1} d, \quad n \geq 3 \tag{12}$$

For the albedo and temperature, respectively

$$a = \begin{cases} A_0 \\ T_O \end{cases} \tag{13}$$

$$b = \begin{cases} k_H k_O k_T - k_S \\ k_T (1 - A_0) \end{cases} \tag{14}$$

$$c = \begin{cases} 0 \\ k_T k_S \end{cases} \tag{15}$$

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and for both,

$$d = k_H k_O k_T \tag{16}$$

So with the correspondences $y \sim T$, and $y_i \sim t_i$,

$$t_0 = T_0 \tag{17}$$

$$t_1 = b - ad = k_T(1 - A_0) - T_0 k_H k_O k_T \tag{18}$$

$$t_2 = c - bd + ad^2 = k_T k_S - k_T(1 - A_0) k_H k_O k_T \tag{19}$$

and

$$t_n = -t_{n-1} k_H k_O k_T, \quad n \geq 3 \tag{20}$$

In the IPCC model, k_T is a constant climate sensitivity, and k_H, k_O, and k_S don't appear, and in that case

$$T_{IPCC} = T_0 + k_T(1 - A_0) \tag{21}$$

Instead with the Cloud Albedo Model, the sensitivity of albedo to humidity, k_O, is the negative cloud albedo feedback in Equation (16) multiplying ΔS and in Equation (17), a factor of ΔS^2. The albedo sensitivity to solar radiation is an amplifier, appearing in Equation (17) as a cofactor of k_T to multiply ΔS^2.

Albedo is similarly represented by

$$a_0 = A_0 \tag{22}$$

$$a_1 = k_H k_O k_T(1 - A_0) - k_S \tag{23}$$

and

$$a_n = -a_{n-1} k_H k_O k_T, \quad n \geq 2 \tag{24}$$

So

$$A = A_0 + (k_H k_O k_T(1 - A_0) - k_S)\,\Delta S^2 - (k_H k_O k_T(1 - A_0) - k_S)\,k_H k_O k_T \Delta S^2 + \ldots \tag{25}$$

and when the product $k_H k_O k_T$ is sufficiently small,

$$A \approx A_0 - k_S \Delta S + k_S k_H k_O k_T \Delta S^2 \tag{26}$$

In the proposed model, albedo is linear with ΔS, with a small quadratic component. Meanwhile, temperature and humidity have the complementary effect, showing the amplification of the solar output and the negative feedback of albedo. The albedo amplification of the Sun would be rapid, while its negative feedback would be slow because of the lag in the ocean to produce increased humidity.

This model is approximately linear over a wide range of useful values for the constants, which remain to be optimized. With increasing solar output, Earth's temperature and atmospheric humidity increase while albedo decreases. Here is a sample set:

CLOUD COVER MODEL PARAMETERS

#	Parameter	Value	Comments
1	A_0	0.3	Nominal current value
2	T_0	133.4	For anomalies
3	H_0	30%	Nominal current value
4	k_0	0.0001	Nominal current value
5	k_0	0.1	
6	k_S	0.1	
7	k_H	31	For T = 1.1°C @ ΔS = 0.055

Between 1862 and 1998, temperature rose 1.1°C (Figure 5) while TSI increased 0.22 Wm^{-2} (Figure 9, bold). Dividing by 4 for the geometric effect on Earth, the solar input increased by 0.055.

This cloud albedo model amplifies the Sun in the short term, and introduces the Earthly lags in the long term that tune the climate, making it selective to long term variations on the Sun.

I. PATTERNS IN THE SUN

The next task is to search for a pattern in the Sun irradiance much longer than the solar cycle. A robust pattern is sought similar to that characterizing the instrument record for temperature, which spans about 150 years. Instead of a single, best fit criterion from end-to-end, the problem suggests analyzing the solar irradiance varying the trend span from 11 years to 150 years. Instead of analyzing the solar pattern at the single point of today, it needs to be assessed at every point in the modern instrument record, from 150 years ago to the present. For every span and every point in time, this filtering provides a running record of the trend of the solar intensity.

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IPCC began a similar analysis of the global surface temperature, shown next.

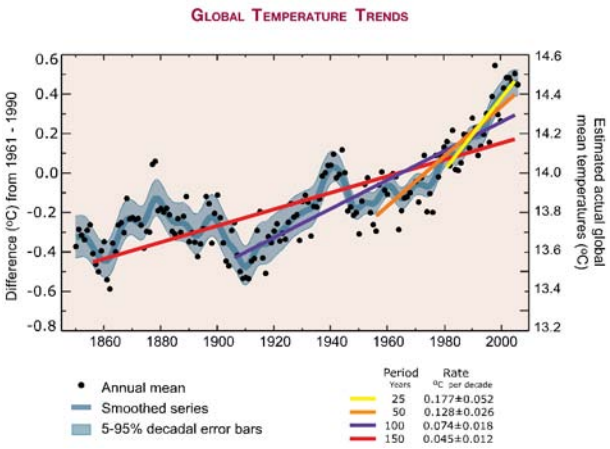

Figure TS.6. Annual global mean temperatures (black dots) with linear fits to the data. The left hand axis shows temperature anomalies relative to the 1961 to 1990 average and the right hand axis shows estimated actual temperatures, both in °C. Linear trends are shown for the last 25 (yellow), 50 (orange), 100 (magenta) and 150 years (red). The smooth blue curve shows decadal variations (see Appendix 3.A), with the decadal 90% error range shown as a pale blue band about that line. The total temperature increase from the period 1850 to 1899 to the period 2001 to 2005 is 0.76°C ± 0.19°C. Top figure deleted, AR4, Technical Summary, p. 37.

FIGURE 15

IPCC characterizes the present day temperature response by measuring the rate of temperature increase from trends for four time spans of interest. This choice dramatizes the hockey stick effect by showing that the angle to the tip of the stick blade gets steeper when viewed closer to the blade.

IPCC urges its readers to read a significance into the latest temperature trends, those going back from 25 to 150 years. It doesn't explore how those trends appeared at other times past. For example, the next figure shows the 25 year trend lines as they might have characterized temperature, drawn every five years.

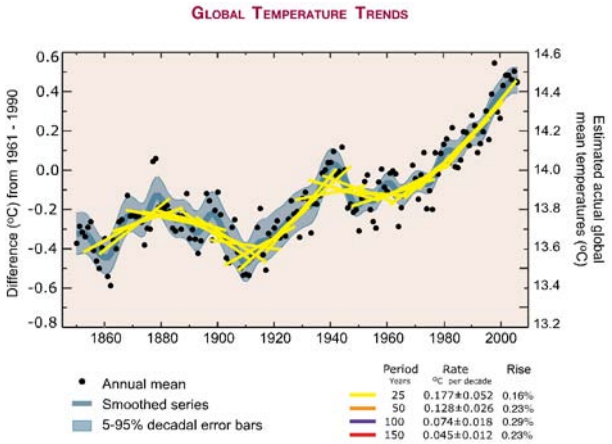

FIGURE 16

The chart also shows the rise over the original four trend periods, in percentage of degrees Kelvin, following IPCC's idea to characterize the solar energy trend by the ratio of its rise over the period. Showing the trends at every sample point, or for more intervals, quickly overwhelms the chart. The important measure is the slope of the running trend, measured at every point. That is the measure analyzed below.

1. IPCC VERNACULAR

IPCC says of the trend method,

> *Another low-pass filter, widely used and easily understood, is to fit a linear trend to the time series although there is generally no physical reason why trends should be linear, especially over long periods. The overall change in the time series is often inferred from the linear trend over the given time period, but can be quite misleading. Such measures are typically not stable and are sensitive to beginning and end points, so that adding or subtracting a few points can result in marked differences in the estimated trend. Furthermore, as the climate system exhibits highly nonlinear behaviour, alternative perspectives of overall change are provided by comparing low-pass-filtered values (see above) near the beginning and end of the major series.*
>
> ...
>
> *As some components of the climate system respond slowly to change, the climate system naturally contains persistence.* AR4, Appendix 3.A *Low-Pass Filters and Linear Trends*, p. 336

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IPCC is correct to look for physical reasons for its modeling, but seems to confuse the real world with its models. The real world has no coordinate systems, parameters, or values. It has neither infinities nor infinitesimals. It cannot have the properties of scale or linearity. These are all manmade concepts that lead to valid models, that is, models with the ultimate scientific property of predictive power. These are all properties of models of the real world.

Mathematical models have poles, meaning singularities at which a dependent parameter becomes infinite or undergoes perpetual oscillation. These are instabilities, and a stable system or a stable state is always finite, and any oscillations are damped. The most violent of natural phenomena, supernova in astronomy, and volcano eruptions in geology, are the largest witnessed events in their fields, but in the end are finite in energy, in time, and in space. Man has observed nothing infinite or infinitesimal. Things become infinite in models that employ rates or densities in which the denominators vanish. Nature doesn't give a fig about man's models.

IPCC is not particular enough about definitions, as discussed above or in the ***Rocket Scientist's Journal*** for *equilibrium, residence time, cloud albedo*, and now for *stable* or *linearity*. It defines nonlinear as the absence of a "*simple proportional relation between cause and effect*." AR4, Glossary, p. 949. The word *simple* qualifies and blunts a promising definition. But the existence ever of cause and effect is an axiom in science, notwithstanding some painfully obvious counterexamples. Linearity has a precise definition in mathematics and system theory. A system is linear if the response to a linear combination of inputs is that same linear combination of the individual responses. What might be linear in, say, cylindrical coordinates, becomes nonlinear in Cartesian coordinates. The Beer-Lambert Law states that absorbance by a gas is linear in the product of concentration and the distance traveled (from the probability of a collision), but it also expresses gas radiative forcing as the non-linear complement of an exponential in gas concentration. A linear relationship in the macroparameters of thermodynamics is likely nonlinear on smaller scales, that is, in mesoparameter or microparameter spaces. Linearity is a state of mathematical being, and is not continuously measurable. It exists or not. A system cannot be "*highly nonlinear*". That "*the climate system exhibits highly nonlinear behavior*" (AR4, Appendix 3A, p. 336) is doubly meaningless.

> *Similarly, although the climate system is highly nonlinear, the quasi-linear response of many models to present and predicted levels of external radiative forcing suggests that the large-scale aspects of human-induced climate change may be predictable, although as discussed in Section 1.3.2 below, unpredictable behaviour of non-linear systems can never be ruled out*. TAR, ¶1.2.2 *Natural Variability of Climate,* p. 91.

Nothing can be *highly nonlinear*, and nothing in the real world can be nonlinear. Models, on the other hand, will always be linear or not. Furthermore, linearity is not a prerequisite for predictability as IPCC suggests. Radiation transmission through a gas is nonlinear in concentration or distance as predicted by the Beer-Lambert Law. Outgassing of CO2 from the ocean to the atmosphere is nonlinear in atmospheric partial pressure according to Henry's Law.

2. SYSTEMS SCIENCE PRINCIPLES

IPCC's reconstructions are built on measurements with extremely low signal-to-noise ratio. The trend line will indeed be noisy, not unstable. It might be vertical, meaning that the rate or slope is infinite, but that doesn't mean that the line ceases to exist, or that correlation has vanished. The trend line inherits its noise from the underlying measurements, and by its very nature is less noisy than the data, making it most useful in detection and estimation.

The trend line is always less noisy than the data it fits, but it can still be highly variable. This can be overcome by measuring it frequently, whether in time or space. A good filter has the property of being reversible. This means that the input can be reconstructed from the output without loss, given a sufficiency of initial conditions. That the linear trend line is a reversible filter may be a conjecture, but given the initial conditions and the trend line at each data point, the original data appear to be reproducible. The complete record of the trend line may be a lossless representation of the input data at every width or span of calculation. It is certainly objective, a scientific necessity. A tangential conjecture or assumption here is that the representation by a complete set of trend samples retains all the information in the original signal.

What is important here in solar radiation is Earth's response to the driving energy. By its nature, climate on the largest scale is a low pass system in response to that energy. And because Earth returns energy back to space

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but most importantly not instantaneously, it should be well modeled by finite delay lines.

Oceans, because of their mass, their heat capacity, and their color, are the dominant mechanism of Earth's energy balance between the Sun and space. The atmosphere as a reservoir plays a minute role, and is well-represented as a byproduct of the ocean. And the ocean is the distributor of the carbon cycle, the hydrological cycle, and the energy cycle. The ocean's complex patterns of circulation across the surface, and between the surface and the deeper ocean, produce a pattern of delays, with some cycle times exceeding a millennium. These are evident in the concentration of CO2 cross-correlated with temperature. Consequently, temperature might be best modeled as a set of relatively narrowband accumulators of solar energy. An analog to this process in electronics and signal processing is the tapped delay line.

If Earth's climate had resonators that responded to sinusoids, the best characterization of solar energy might be its Fourier spectrum. The point is that how a system responds can be a guide to how best to characterize its driving inputs. This is the physical reason IPCC denied existed. The conjecture that climate temperature responds with one or more finite delays suggests characterizing solar energy with finite time filters. The fixed span trend line is a first-order finite time filter. It finds regular use as the first step in signal analysis, often discarded under the name of detrending, but sometimes, as here, containing the wanted information. IPCC repeatedly states that it seeks no more than a first order effect with its radiative forcing paradigm. See for example, TAR, Ch. 6 *Radiative Forcing of Climate Change*, Executive Summary, p. 351.

This paper reports the successful search for Earth's temperature pattern using the trend line applied to the noisy source, Total Solar Irradiance, as modeled by Wang, et al. (2005). The parameter of interest is the increase in solar radiation over the term of the span, normalized by the value at the start of the span. It is the ratio expressed as the percentage increase. This is analogous to IPCC's determination that over 250 years, the Wang model increased 0.05%. For each span, a computer routine computes the maximum sampled ratio since 1900. Equation (12). The set of all such maxima produces a curve, shown in Figure 17:

$$f(\tau) = \max |_{t=1900}^{1997} trend\left(S(\tau)|_{t-\tau}^{t} \right) \qquad (27)$$

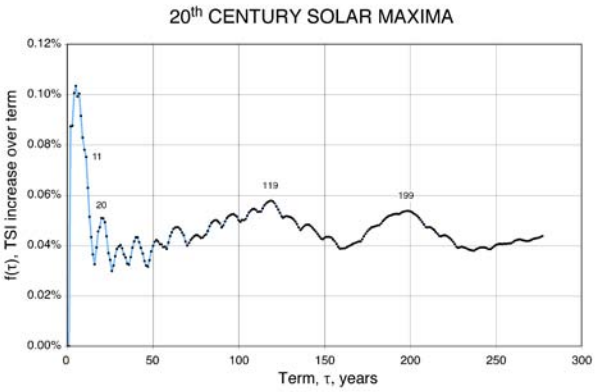

FIGURE 17

The curve has labels for the 11-year point, and three local maxima, 20, 119, and 199 years. The search for maxima since 1900 is to avoid uncompensated start up effects. Because this trend model only looks back in time, it is what is known as a realizable or causal filer. This means that the real Earth or an emulating model could have actually responded to the data included in the filter.

To the contrary, IPCC employs centered symmetrical filters for its data records, which are unrealizable, meaning filters that are aware of the future. IPCC's results are thus subjectively attractive, but to the extent that it applies such filtered to data to its models, its work is physically problematic and not objective. A prime example is IPCC's unquantified attribution of the glacial cycles to the Milankovitch cycles (AR4 FAQ 6.1, with the humorous title "*What Caused the Ice Ages and Other Important Climate Changes* ***Before the Industrial Era***", bold added). Wikipedia falls in line, but steps over it to say, "*Past and* ***future*** *Milankovitch cycles. VSOP [Variations Séculaires des Orbites Planétaires] allows prediction of past* ***and future*** *orbital parameters* ***with great accuracy.***" Bold added. Wikipedia puts the lie to its claim by saying the Milankovitch Climate model is "not perfectly worked out" (as if perfection were ever achieved in any science), listing eight named problems, which IPCC minimizes. See for example AR4 ¶6.7 *Concluding Remarks on Key Uncertainties*, p. 483. Among those problems are a mismatch between the magnitudes of the orbital forcings and the climate response, and a causal problem with the penultimate glacial cycle. IPCC tries to salvage its AGW theory by making CO2 an agent of the Milankovitch theory, amplifying the variations without triggering them. AR4 Ch. 6, Executive Summary, p. 435. When the CO2 proves insufficient as a positive feedback, IPCC adds water

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vapor as the next, most important, and as clouds, the least understood feedback. AR4 FAQ 1.3 *What is the Greenhouse Effect?*, p. 116; AR4, Ch. 8, *Executive Summary*, p. 593; AR4 ¶8.6.3.2 Clouds, p. 636. This cascade of speculation about causes and effects arises out of a lack of causality coupled into a model for Earth's climate that is only conditionally stable, on the cusp of being triggered into a new state by an unidentified event, or crossing a model "*tipping point*". Nature doesn't have systems balanced on a knife edge, round boulders perched on the sides of hills, or cones standing on their tips. To be objective, investigators should model Earth as deeply stable, that is, requiring by definition cataclysmic events to dislodge it from its conditionally stable state, and instead responding gradually to causal forces.

Following are examples of a search for causal extractions of Total Solar Irradiation (TSI). Each chart contains a set of three running linear trends, used as a check for anomalous behavior. The traces include uncompensated end effects allowed to go off scale.

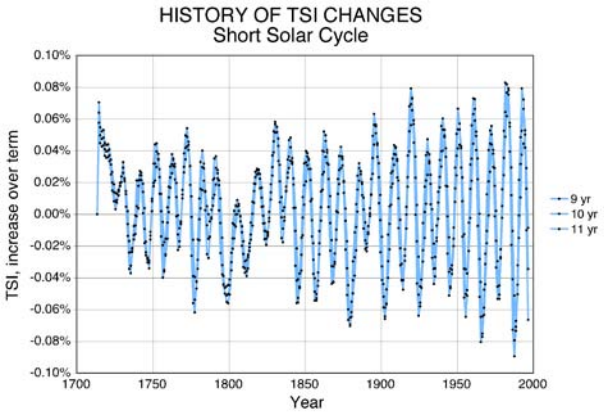

FIGURE 18

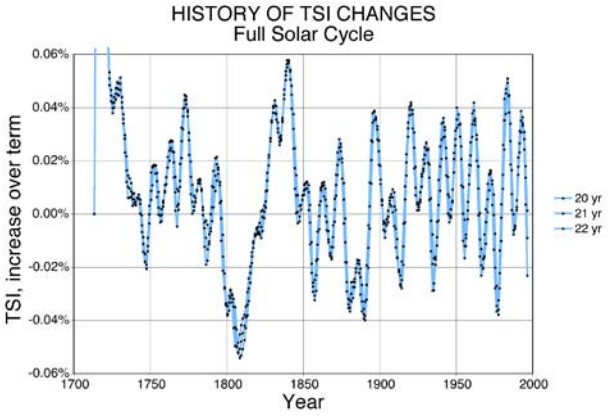

FIGURE 19

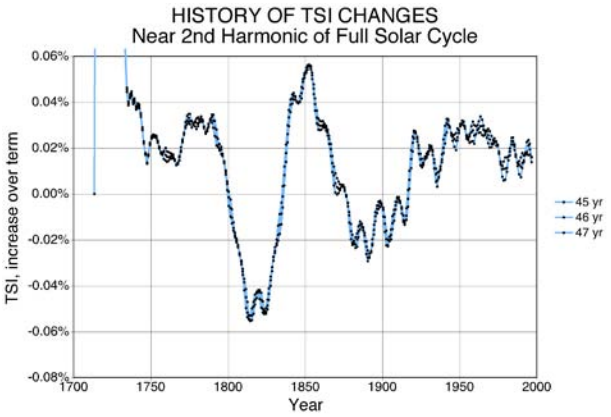

FIGURE 20

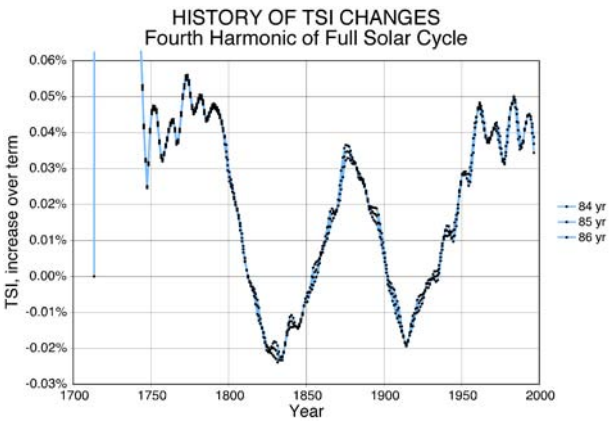

FIGURE 21

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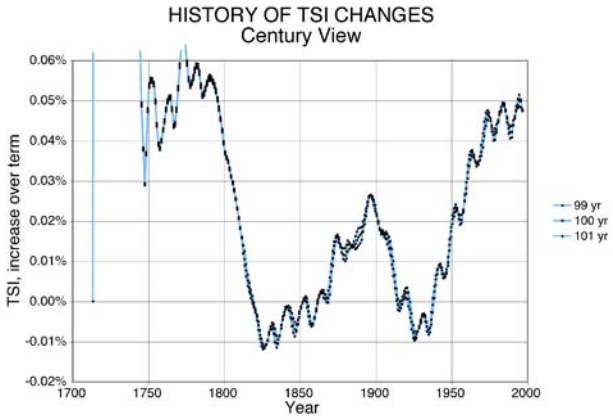

FIGURE 22

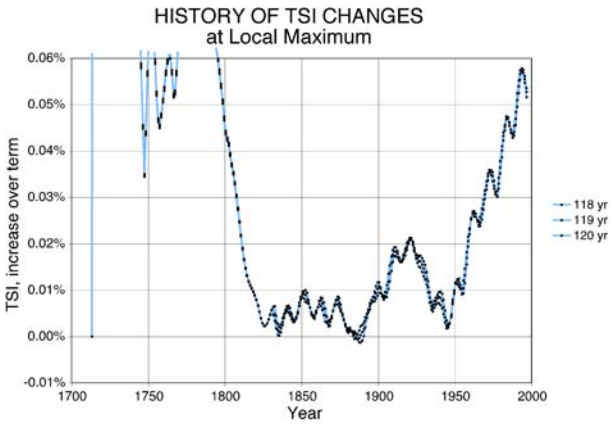

FIGURE 23

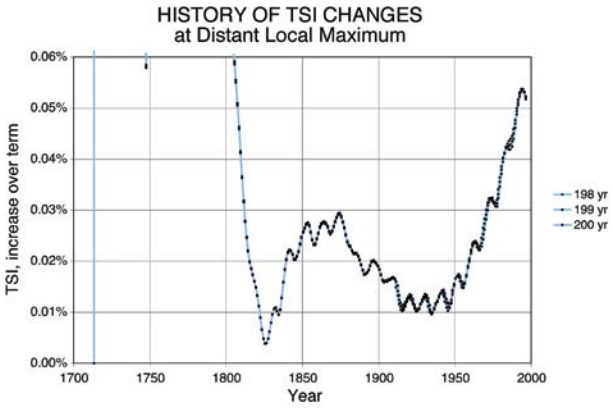

FIGURE 24

The important new result occurs at a span of 134 years, shown next, now co-plotted with the modern temperature record.

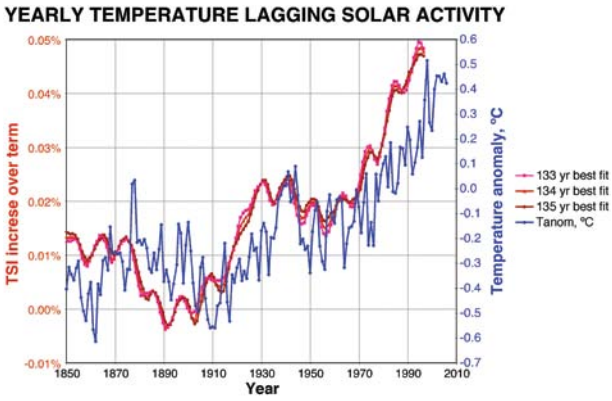

FIGURE 25

The 134-year solar running trend alone provides an excellent model for the global average surface temperature over its entire instrument record, as shown next in Figure 23:

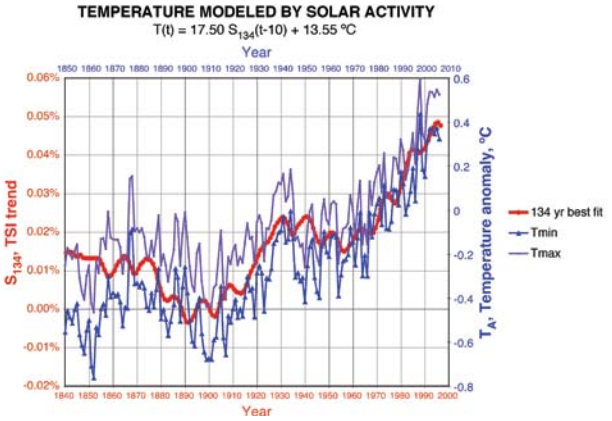

FIGURE 26

In Figure 26, the temperature scale is offset 10 years with respect to the TSI trend scale to account for the lag. The temperature consists of two traces, the maxima and minima from the HadCRUT3 error bar ranges given by IPCC in Figures 1 and 6, above, and Figure 33, below. The ordinate scale centers the TSI trend in the temperature range, which provides the final equation. Adding the next most significant term discovered so far, the global average surface temperature is Equation (1), above, and repeated here:

$$T(t) = m_{134}S_{134}(t-\tau) + m_{46}S_{46}(t-\tau) + b \qquad (1)$$

The chart with two terms is Figure 1, above, accompanied by the parameter values. For the temperature anomaly, T_A, set b = -0.45°C.

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J. IMPLICATIONS ON CLIMATE PROCESSES & FURTHER STUDY.

Demonstrated filtering of solar intensity exposes a strong signal in the best available model for the Sun, a signal that closely approximates the best available record of climate temperature, and one spanning 160 years. These same sources relied upon by IPCC are the Wang, et al. TSI model of AR4 Figure 2.17 (Figures 9 and 10, above), and the HadCRUT3 temperature record of AR4 Figure 3.6 (Figures 1 and 6, above). Certainly the signal on the Sun was caused neither by the industrial revolution nor any greenhouse effect; it does not bear the fingerprint of humans.

The Sun is the only significant cause for Earth's climate to have ranged from a few degrees Celsius to a maximum of about 17ºC (an anomaly range of about -9ºC to 3ºC). The new results here constitute the only evidence showing more specifically that the Sun is also the cause of the observed variations of Earth's surface temperature over the last century and a half, the entire instrument record, and more than likely the cause over the geological record.

This model for the Sun is an à posteriori model, meaning that it is based on experiment, as was the Wang, et al. model. It provides opportunities for further improvements. For example, a modeler might discover a better filter than the trend, especially one based on physical processes on Earth, in the fashion that Wang, et al. matched experimental data with a randomized collection of solar eruptions called Bipolar Magnetic Regions (BMRs). A sum of mutually orthogonal (uncorrelated) waveforms might provide a superior filter, and a coefficient for each to best fit Earth's temperature record. Regardless, a fine model for Earth's Global Average Surface Temperature is immediately available that fits well within the uncertainty of measuring and estimating the unmeasurable macroparameter of the global average surface temperature, and the uncertainty in the TSI model.

To develop an à priori model, a model from physical reasoning, a link is needed to account for the relative small energy in the otherwise well-formed solar signal. The secular scale factor adopted by Wang should be re-examined. An amplifier in the climate is needed, and albedo is the obvious choice and it remains to be theoretically quantified. The radiant heating model, balancing the net shortwave radiation in and the long wave radiation out, is still valid. However, the parameter of consequence is not the radiative forcing of the Sun located somewhere between the top and the bottom of the troposphere and under a clear sky. What counts is the insolation at the surface, averaged over all possible cloud covers, suitably weighted.

This experimental model for Sun-induced climate variability arose out of consideration of the ocean's multiple, finite delays in energy distribution. This opens several avenues for future supporting studies. One is to investigate the class of problems in which a source might be characterized as it is manifest on a receiver. The second is to model the energy distribution of the ocean as a tapped delay line. For additional future work, see Conclusions, below.

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III. FINGERPRINTS

A model in which the Sun impresses its energy pattern on Earth's climate is plainly inconsistent with IPCC's three-pronged argument for patterns of human activities to have imprinted the observed warming. IPCC urges (1) that the depletion of atmospheric oxygen matches the rate of increase of atmospheric CO2, (2) that the decline in the isotopic weight of atmospheric CO2 matches fossil fuel emissions, and (3) the sudden rise in gas concentrations and temperature match the onset of the industrial era, the family of hockey stick graphs. Of these imprint patterns, only one is strong, extensive, complex, and genuine: the Sun's fingerprint on Earth's temperature.

A. OXYGEN DEPLETION & $\delta^{13}C$ LIGHTENING DO NOT MATCH HUMAN ACTIVITIES.

IPCC asks and answers this "frequently asked question":

> ***Are the Increases in Atmospheric Carbon Dioxide and Other Greenhouse Gases During the Industrial Era Caused by Human Activities?*** AR4, Frequently Asked Question 7.1, p. 512.

The answer of course is no, but IPCC answers in the affirmative, relying on two record comparisons and one logical proposition – all false. It says,

> ***Yes, the increases in atmospheric carbon dioxide (CO2) and other greenhouse gases during the industrial era are caused by human activities.*** *In fact, the observed increase in atmospheric CO2 concentrations does not reveal the full extent of human emissions in that it accounts for only 55% of the CO2 released by human activity since 1959. The rest has been taken up by plants on land and by the oceans. In all cases, atmospheric concentrations of greenhouse gases, and their increases, are determined by the* [mass] *balance between sources (emissions of the gas from human activities and natural systems) and sinks (the removal of the gas from the atmosphere by conversion to a different chemical compound). Fossil fuel combustion (plus a smaller contribution from cement manufacture) is responsible for more than 75% of human-caused CO2 emissions. Land use change (primarily deforestation) is responsible for the remainder. For methane, another important greenhouse gas, emissions generated by human activities exceeded natural emissions over the last 25 years. For nitrous oxide, emissions generated by human activities are equal to natural emissions to the atmosphere. Most of the long-lived halogen-containing gases (such as chlorofluorcarbons) are manufactured by humans, and* ***were not present in the atmosphere before the industrial era*** [i.e., unprecedented]. *On average, present-day tropospheric ozone has increased 38% since pre-industrial times, and the increase results from atmospheric reactions of short-lived pollutants emitted by human activity.* ***The concentration of CO2 is now 379 parts per million (ppm) and methane is greater than 1,774 parts per billion (ppb), both very likely much higher than any time in at least 650 kyr (during which CO2 remained between 180 and 300 ppm and methane between 320 and 790 ppb)*** *[i.e., unprecedented]. The recent rate of change is dramatic and* ***unprecedented****; increases in CO2 never exceeded 30 ppm in 1 kyr – yet now CO2 has risen by 30 ppm in just the last 17 years. ...* [¶]
>
> *The natural sinks of carbon produce a small net uptake of CO2 of approximately 3.3 GtC* yr^{-1} *over the last 15 years, partially offsetting the human-caused emissions. Were it not for the natural sinks taking up nearly half the human-produced CO2 over the past 15 years, atmospheric concentrations would have grown even more dramatically.*
>
> *The increase in atmospheric CO2 concentration is known to be caused by human activities because the character of CO2 in the atmosphere, in particular the ratio of its heavy to light carbon atoms, has changed in a way that can be attributed to addition of fossil fuel carbon. In addition, the ratio of oxygen to nitrogen in the atmosphere has declined as CO2 has increased; this is as expected because oxygen is depleted when fossil fuels are burned.* Bold added, AR4, FAQ 7.1, p. 512.

IPCC here states its foremost reason for ascribing the recent CO2 increase to man: unprecedented increases. It finds additional support for its anthropogenic model through isotopic lightening, never presenting the requisite mass balance analyses for the isotopic ratio and the commensurate oxygen depletion. IPCC quantifies neither model, but relies for both on a compact, duplex demonstration by graphic sophistry, shown in figure 27.

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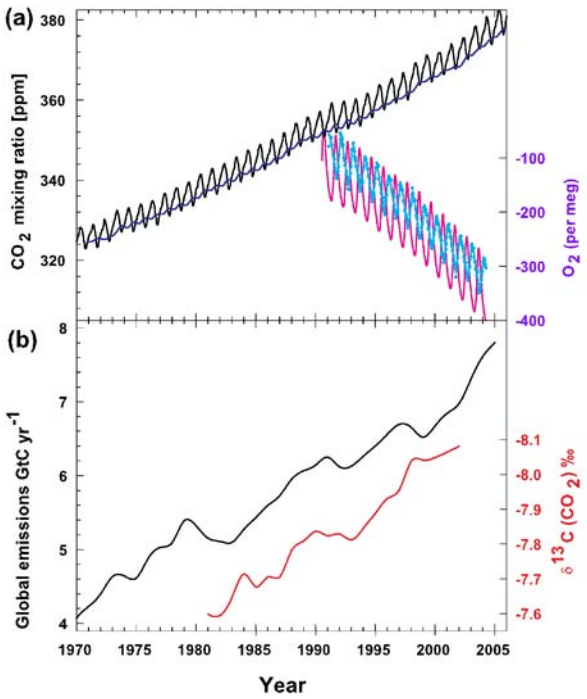

Figure 2.3. Recent CO2 concentrations and emissions. (a) CO2 concentrations (monthly averages) measured by continuous analysers over the period 1970 to 2005 from Mauna Loa, Hawaii (19°N, black; Keeling and Whorf, 2005) and Baring Head, New Zealand (41°S, blue; following techniques by Manning et al., 1997). Due to the larger amount of terrestrial biosphere in the NH, seasonal cycles in CO2 are larger there than in the SH. In the lower right of the panel, atmospheric oxygen (O2) measurements from flask samples are shown from Alert, Canada (82°N, pink) and Cape Grim, Australia (41°S, cyan) (Manning and Keeling, 2006). The O2 concentration is measured as 'per meg' deviations in the O2/N2 ratio from an arbitrary reference, analogous to the 'per mil' unit typically used in stable isotope work, but where the ratio is multiplied by 10^6 instead of 10^3 because much smaller changes are measured. (b) Annual global CO2 emissions from fossil fuel burning and cement manufacture in GtC yr^{-1} (black) through 2005, using data from the CDIAC website (Marland et al, 2006) to 2003. Emissions data for 2004 and 2005 are extrapolated from CDIAC using data from the BP Statistical Review of World Energy (BP, 2006). Land use emissions are not shown; these are estimated to be between 0.5 and 2.7 GtC yr^{-1} for the 1990s (Table 7.2). Annual averages of the $^{13}C/^{12}C$ ratio measured in atmospheric CO2 at Mauna Loa from 1981 to 2002 (red) are also shown (Keeling et al, 2005). The isotope data are expressed as $\delta^{13}C(CO2)$ $^0/_{00}$ (per mil) deviation from a calibration standard. Note that this scale is inverted to improve clarity. AR4, p. 138.

FIGURE 27

IPCC shifted and scaled both the O2 and the $\delta^{13}CO2$ traces to give the false appearance in (a) that O2 is anti-parallel to the growth in CO2, and in (b) that $\delta^{13}CO2$ parallels the estimate of carbon emissions. Even at that, IPCC did not draw the O2 trace exactly parallel, as revealed in the next figure, shown in graph coordinates, O2 now reversed. IPCC's scale was arbitrary, and is shown here in inches following conversion of a pdf version of the original report.

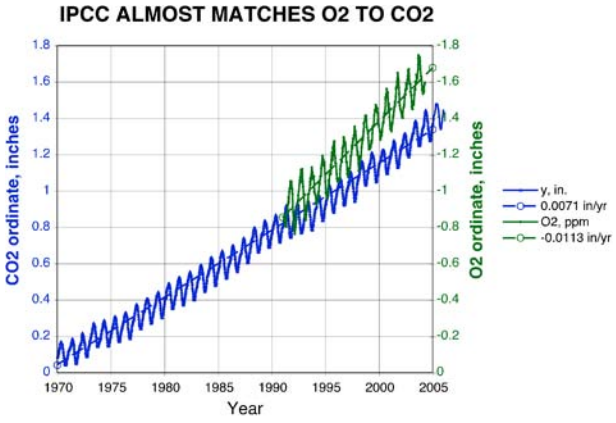

FIGURE 28

IPCC's argument is that the decline in O2 matches the rise in CO2 and therefore the latter is from fossil fuel burning. Every molecule of CO2 created from burning in the atmosphere should consume one molecule of O2 decline, so the traces should be drawn identically scaled in parts per million (1 ppm = 4.773 per meg (Scripps O2 Program)). Corrected to remove the graphical bias, the data diverge as shown next.

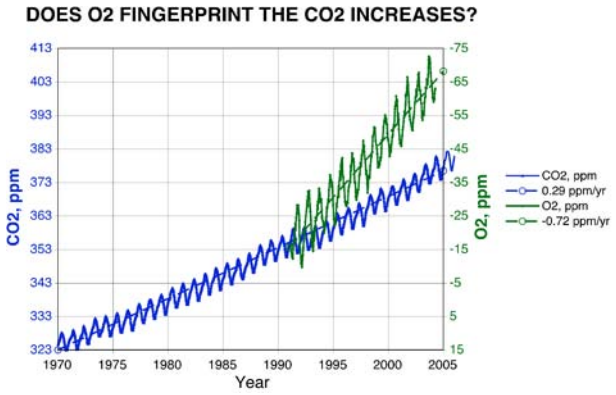

FIGURE 29

Contrary to the Panel's claim, oxygen consumption fails as a fingerprint for ACO2.

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Carbon's isotopic ratio fairs no better. Under the banner of "*The Human Fingerprint on Greenhouse Gases*", IPCC gushed:

> *The high-accuracy measurements of atmospheric CO2 concentration, initiated by Charles David Keeling in 1958, constitute the master time series documenting the changing composition of the atmosphere (Keeling, 1961, 1998). These data have iconic status in climate change science as evidence of the effect of human activities on the chemical composition of the global atmosphere (see FAQ 7.1). Keeling's measurements on Mauna Loa in Hawaii provide a true measure of the global carbon cycle, an effectively continuous record of the burning of fossil fuel. They also maintain an accuracy and precision that allow scientists to separate fossil fuel emissions from those due to the natural annual cycle of the biosphere, demonstrating a long-term change in the seasonal exchange of CO2 between the atmosphere, biosphere and ocean. Later observations of* ***parallel trends*** *in the atmospheric abundances of the 13CO2 isotope (Francey and Farquhar, 1982) and molecular oxygen (O2) (Keeling and Shertz, 1992; Bender et al., 1996) uniquely identified this rise in CO2 with fossil fuel burning (Sections 2.3, 7.1 and 7.3).* Bold added, AR4, ¶1.3.1, p. 100.

None of these claims withstands scrutiny, but this passage serves at this juncture to underscore IPCC's reliance on parallel trends. In theory, had the O2 trace been anti-parallel to the CO2 emissions, IPCC might have produced a fingerprint for human involvement. IPCC attempted to produce anti-parallel records by gimmickry with the chart. The isotopic analysis is equally unscientific.

IPCC manufactured two parallel traces out of the rate of CO2 emissions and the history of $\delta^{13}C$ by graphical shifting and scaling. IPCC Figure 2.3(b), (Figure 27 above). First, look at the fraudulent technique, as shown next, even though no physical reason exists for these two records to be parallel.

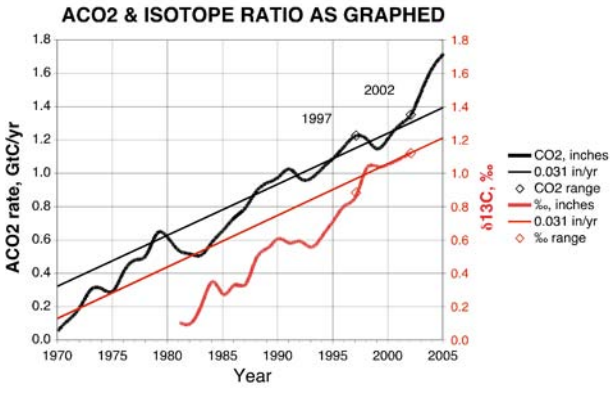

FIGURE 30

The graph is in pdf inches, converted from IPCC's AR4 Figure 2.3, above. IPCC scaled the isotopic trace to be parallel in the ACO2 rate trace with respect to the two five year trends shown. It shifted the isotopic trace to lie just below the ACO2 rate so it was easy to see how parallel they were. Had IPCC not shifted and scaled one trace with respect to the other, and instead objectively used the full available range of the chart, the figure might have appeared as shown next:

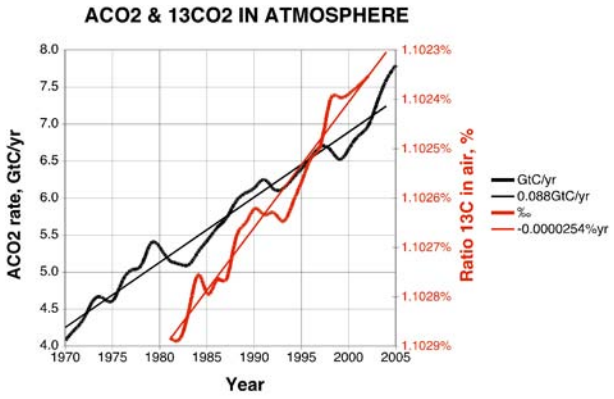

FIGURE 31

In other words, IPCC made non-parallel traces parallel by graphical shenanigans.

A relationship does exist between $\delta^{13}C$ and ACO2, but only indirectly between it and the rate of emissions, ACO2 rate. The relationship is not complicated, once the traditional delta ratio, a legacy from a time long before computers, is simplified. The definition of the ratio is straightforward, although the reference point, the PeeDee belemnite ratio R_{PDB}, is a bit obscure and even ambiguous.

$$\delta^{13}C \triangleq \frac{R - R_{PDB}}{R_{PDB}} \qquad (28)$$

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where, with [.] meaning concentration of,

$$R_{PDB} = \frac{[13C]}{[12C]}\bigg|_{PDB} \triangleq \frac{G_{13}}{G_{12}}\bigg|_{PDB} = 0.0112372 = \frac{1}{88.9901399} \quad (29)$$

e.g., Keeling, C.D., et al., (2001), Table 3, (p. 50 of 91).
On the other hand,

$$R_{PDB} = \frac{[13C]}{[12C]+[13C]}\bigg|_{PDB} \triangleq \frac{G_{13}}{G_{12}}\bigg|_{PDB} = 0.01111233 = \frac{1}{88.9901399} \quad (30)$$

e.g., Tans, P.P., et al., (2003), p. 355. In recognition that Keeling's definition may be most common in the literature, while the second is the more useful for this paper, the following definitions shall apply:

$$R \triangleq \frac{G_{13}}{G_{12}} \quad (31)$$

and

$$r \triangleq \frac{G_{13}}{G} \quad (32)$$

With these relations,

$$\delta^{13}\,C = \frac{1}{(r^{-1}-1)\,R_{PDB}} - 1 \quad (33)$$

and in the other direction, the ratio of G_{13} to G, r, in terms

$$r = \left(\left((\delta^{13}C+1)\,R_{PDB}\right)^{-1}+1\right)^{-1} = \frac{1}{1+\frac{88.9901399}{(1+\delta^{13}C)}} \quad (34)$$

With these results, the ergonomic but esoteric δ13C can disappear, and the graph of IPCC's Figure 2.3 or Figure 34 immediately scaled in terms of the ratio of 13C, *r*:

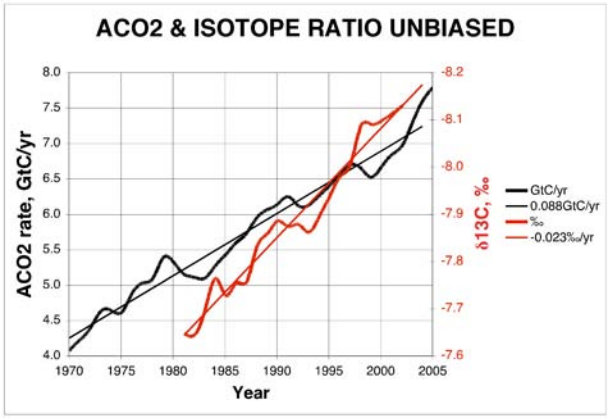

FIGURE 32

The value of $\delta^{13}C$ becomes evident – it solves the human problem of dealing with changes in the fifth significant figure. In other words, the isotopic ratio solves the problem humans have coping with the first four significant figures being insignificant.

With the value of *r* for the atmosphere, r_a, at any time and the value for the ACO2, principally attributed to fossil fuel burning, r_f, a new value of r_a or, equivalently, $\delta^{13}C$ can be readily derived for the a slug of ACO2 added to the atmosphere and well-mixed. However in spite of the importance, values for $\delta^{13}C_a$ and $\delta^{13}C_f$ are rare in the literature. IPCC cites neither, and apparently used neither. Battle, et al., (2000) provided the following estimates:

$$\delta^{13}C_a\,(1995) = -7.86‰ \pm 0.015‰ \quad (35)$$

and

$$\delta^{13}C_f = -29.4‰ \pm 1.8‰ \quad (36)$$

Battle, M., et al., (2000), cited by IPCC, AR4 Ch. 7, pp. 520, 524, 568.

These equations yield

$$r_a\,(1995) = 1.102595\% \quad (37)$$

and

$$r_f = 1.078915\% \quad (38)$$

These definitions and equations reduce to the following equation:

$$r\,(t) = \frac{G_{13}(t)}{G(t)} = \frac{G_0\,r_0 + g(t)\cdot k\cdot r_f}{G_0 + g\,(t)\cdot k} = \frac{r_0 + x(t)\cdot k\cdot r_f}{1 + x(t)\cdot k} \quad (39)$$

where G_0 and r_0 are the initial conditions, ***k*** is the ratio of ACO2 retained in the atmosphere, *g(t)* is the total ACO2 emitted to time t, and *x(t)* is ratio of the total ACO2 emitted to the initial atmospheric content.

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Following are four possible solutions to the mass balance problem.

ACO2 ISOTOPIC FINGERPRINT IS NOT A MATCH

#	Parameter	Value	Source
1	G_0	762	AR4 Fig. 7.3, p. 515 C cycle
2	g(2003)	133.4	AR4 Fig. 2.3, p. 138
3	$\delta 13C_0$	-7.592‰	AR4 Fig. 2.3, p. 138
4	r_0	0.011028894	Eq. (7)
5	$\delta 13C_f$	**-29.4‰**	Battle, et al.
6	*r*f	0.010789151	Eq. (7)
7	k	50%	AR4 TS p.025
8	r(2003)	0.011009598	Eq. (12)
9	δ13C	**-9.348‰**	Eq. (6)
10	$\delta 13C_{final}$	-8.080‰	AR4 Fig. 2.3, p138

IPCC provides all the parameter values but the one from Battle, et al. Those values with the equations derived above establish the ACO2 fingerprint on the bulge of CO2 measured at MLO, as if it were a well-mixed, global parameter as IPCC assumes.

IPCC does not provide $\delta^{13}C_f$, the parameter found in Battle, et al., suggesting IPCC may have never made this simple mass balance calculation. A common value for that parameter in the literature is around 25‰. The figure from Battle, et al., being published with a tolerance, earns additional respect. As will be shown, the number is not critical. The result is a mismatch with IPCC's data at year 2003 by a difference of 1.3‰, more than twice the range of measurements, which cover two decades.

This discrepancy is huge, and is sufficient to reject the hypothesis that the surge in CO2 seen in the last century was caused by man. The CO2 added to the atmosphere is far heavier than the weight attributed to ACO2.

CO2 SURGE IS TOO HEAVY TO BE ACO2

#	Parameter	Value	Source
1	G_0	762	AR4 Fig. 7.3, p. 515 C cycle
2	g(2003)	133.4	AR4 Fig. 2.3, p. 138
3	$\delta 13C_0$	-7.592‰	AR4 Fig. 2.3, p. 138
4	r_0	0.011028894	Eq. (7)
5	$\delta 13C_f$	**-13.657‰**	Eq. (12)
6	r_f	0.010962235	Eq. (7)
7	k	50%	AR4 TS p25
8	r(2003)	0.011023529	Eq. (7)
9	δ13C	-8.080‰	AR4 Fig. 2.3, p. 138
10	$\delta 13C_{final}$	-8.080‰	AR4 Fig. 2.3, p. 138

This computation, above, is the first of three to examine other parameter values that would have rendered IPCC's fingerprint test affirmative: ACO2 was the cause of the CO2 lightening. The isotopic ratio for fossil fuel would have had to be considerably heavier, -13.657‰ instead of -29.4‰, for the increase in atmospheric CO2 to have been caused by man.

OR, ATMOSPHERIC CO2 IS OVER 1400 PPM

#	Parameter	Value	Source
1	G0	**2913.9**	Eq. (12)
2	g(2003)	133.4	AR4 Fig. 2.3, p. 138
3	δ13C0	-7.592‰	AR4 Fig. 2.3, p. 138
4	r0	0.011028894	Eq. (7)
5	δ13Cf	**-29.4‰**	Battle, et al.
6	rf	0.010789151	Eq. (7)
7	k	50%	AR4 TS p.025
8	r(2003)	0.011023529	Eq. (7)
9	δ13C	-8.080‰	AR4 Fig. 2.3, p. 138
10	δ13Cfinal	-8.080‰	AR4 Fig. 2.3, p. 138

For ACO2 at the stated rate and retention to have caused the small drop measured in atmospheric $\delta^{13}C$, the initial atmosphere concentration would have had to be 2,913.9 GtC, 3.8 times the figure used by IPCC. This is equivalent to 1,453 ppm of CO2 instead of 380 ppm.

OR, 13%, NOT 50%, OF ACO2 REMAINS IN THE ATMOSPHERE

#	Parameter	Value	Source
1	G_0	762	AR4 Fig. 7.3, p515 C cycle
2	g(2003)	133.4	AR4 Fig. 2.3, p. 138
3	$\delta 13C_0$	-7.592‰	AR4 Fig. 2.3, p. 138
4	r_0	0.011028894	Eq. (7)
5	$\delta 13C_f$	**-29.4‰**	Battle, et al.
6	r_f	0.010789151	Eq. (7)
7	k	**13.1%**	Eq. (12)
8	r(2003)	0.011023529	Eq. (7)
9	δ13C	-8.080‰	AR4 Fig. 2.3, p. 138
10	$\delta 13C_{final}$	-8.080‰	AR4 Fig. 2.3, p. 138

The mass balance will agree with the measurements if the atmosphere retains much less than 50% of the estimated emissions. The necessary retention is 13.1%, a factor again of 3.8 less than supplied by IPCC.

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These results apply to IPCC's model by which it adds anthropogenic processes to natural processes assumed to be in balance. Instead, the mass flow model must include the temperature-dependent flux of CO2 to and from the ocean to modulate the natural exchanges of heat and gases. The CO2 flux between the atmosphere and the ocean is between 90 and 100 GtC of CO2 per year. This circulation removes lightened atmospheric CO2, replacing it with heavier CO2 along many paths, some accumulated several decades to over 1000 years in the past. The mass flow model is a mechanical tapped delay line.

B. CUSTOM CARVED HOCKEY STICKS.

From IPCC's standpoint, its hockey stick constructions are too good not to be true. They support its logic of the unprecedented proving causation. Of course, and lest any further misunderstanding arise, the proposition is neither logical nor a theory. Unprecedented establishes nothing but odds, and proof is for mathematics and logic, not science. The Sun does not account for the hockey sticks, those IPCC artifacts of data mishandling, whether intentional or a consequence of IPCC's admitted "*low level of scientific understanding.*"

IPCC urges emergency action from world government to stop global warming, because the present climate is already the warmest in over a millennium and is increasing rapidly due to man's CO2 emissions. Founded in 1988 specifically to advance climate science, later interpreted by IPCC as a charter to promote AGW, IPCC's crowning achievement is featured as the 1st graph of the 1st section of its Third Assessment Report, Climate Change 2001, *Summary for Policymakers*. TAR, p. 3. It is the history of global average temperatures for the past millennium, the Hockey Stick. The Handle of the Stick is the benign, even cooling, past, and the Blade is the unprecedented rapid rise in the 20th Century.

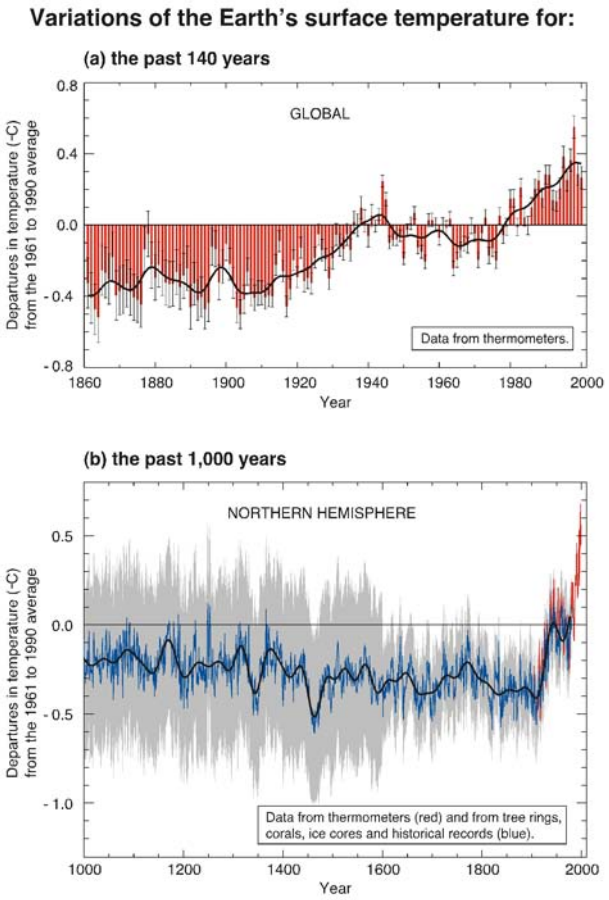

Figure 1: Variations of the Earth's surface temperature over the last 140 years and the last millennium. (a) The Earth's surface temperature is shown year by year (red bars) and approximately decade by decade (black line, a filtered annual curve suppressing fluctuations below near decadal time-scales). ... (b) Additionally, the year by year (blue curve) and 50 year average (black curve) variations of the average surface temperature of the Northern Hemisphere for the past 1000 years have been reconstructed from **"proxy" data calibrated against thermometer data** ... [Based upon ... Chapter 2, Figure 2.20 (p. 132)]. Bold italics added, TAR, SPM, p. 3.

FIGURE 33

Michael E. Mann, lead author of Mann et al. (1999), the credited source of the Hockey Stick, was – coincidentally – a Lead Author of TAR Chapter 2.

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IPCC here practices not science but hucksterism. It put *proxy* in quotes as if to say "not that there's anything wrong with that"; or, everyone knows proxy temperature data are as good as thermometer readings. What should be set off in quotes are *data* and *calibrated*. IPCC unabashedly includes in calibration shifting records to coincide (throwing away the mean), and scaling them to match (wrecking the variance and standard deviation), all for visual effects and never quantified. What IPCC produces are no longer data records, but illusions.

The next piece of the AGW story is corroboration of the link between temperature increasing and the mechanism by which man has caused it. The evidence comprises the chemical hockey sticks in the next figure for Policymakers in the Third Assessment Report:

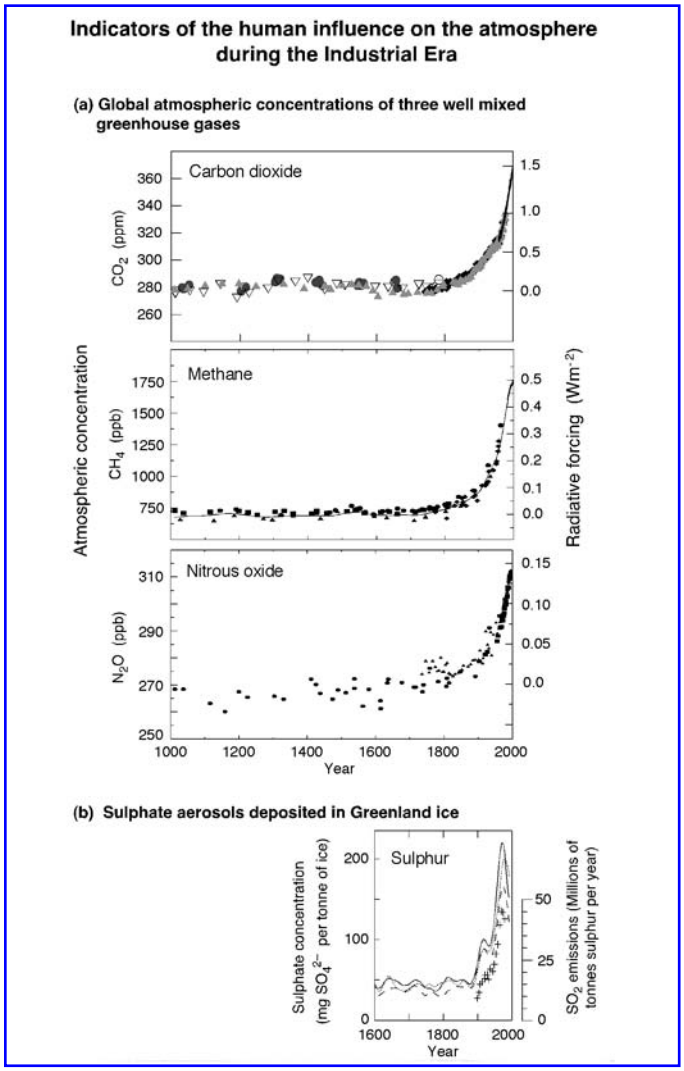

Figure 2: Long records of past changes in atmospheric composition provide the context for the influence of anthropogenic emissions. *(a) shows changes in the atmospheric concentrations of carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O) over the past 1000 years. The ice core and firn data for several sites in Antarctica and Greenland (shown by different symbols) are supplemented with the data from direct atmospheric samples over the past few decades (shown by the line for CO2 and incorporated in the curve representing the global average of CH4). The estimated positive radiative forcing of the climate system from these gases is indicated on the righthand scale.* ***Since these gases have atmospheric lifetimes of a decade or more, they are well mixed, and their concentrations reflect emissions from sources throughout the globe.*** *All three records show effects of the large and increasing growth in anthropogenic emissions during the Industrial Era. ... .* Bold added, TAR SPM, p. 6.

FIGURE 34

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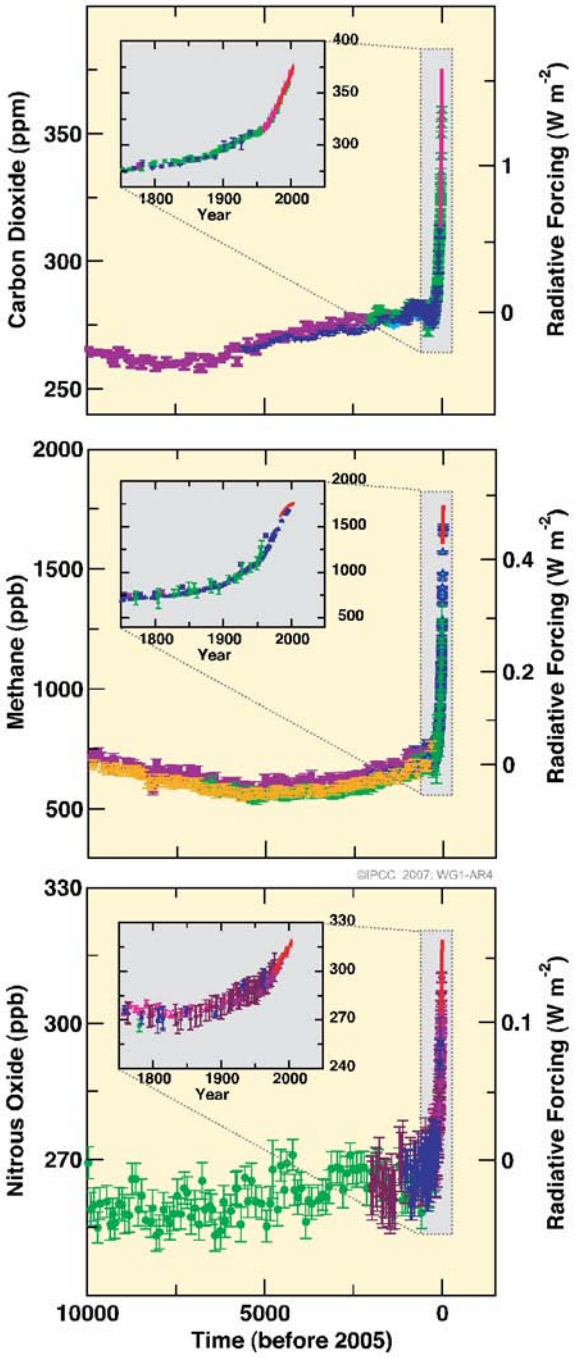
For its Fourth Assessment Report, IPCC polished the gas story for policymakers, adding multiple ice core records, presumably "*calibrated*":



Changes in Greenhouse Gases from Ice Core and Modern Data. Figure SPM.1. *Atmospheric concentrations of carbon dioxide, methane and nitrous oxide over the last 10,000 years (large panels) and since 1750 (inset panels). Measurements are shown from ice cores (symbols with different colours for different studies) and atmospheric samples (red lines). The corresponding radiative forcings are shown on the right hand axes of the large panels.* AR4 Summary for Policymakers, Figure SPM.1.

FIGURE 35

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IPCC above made chemical hockey sticks by cutting the records in half (20 kyr reduced to 10 kyr) in the parent chart, Figure 6.4, below:

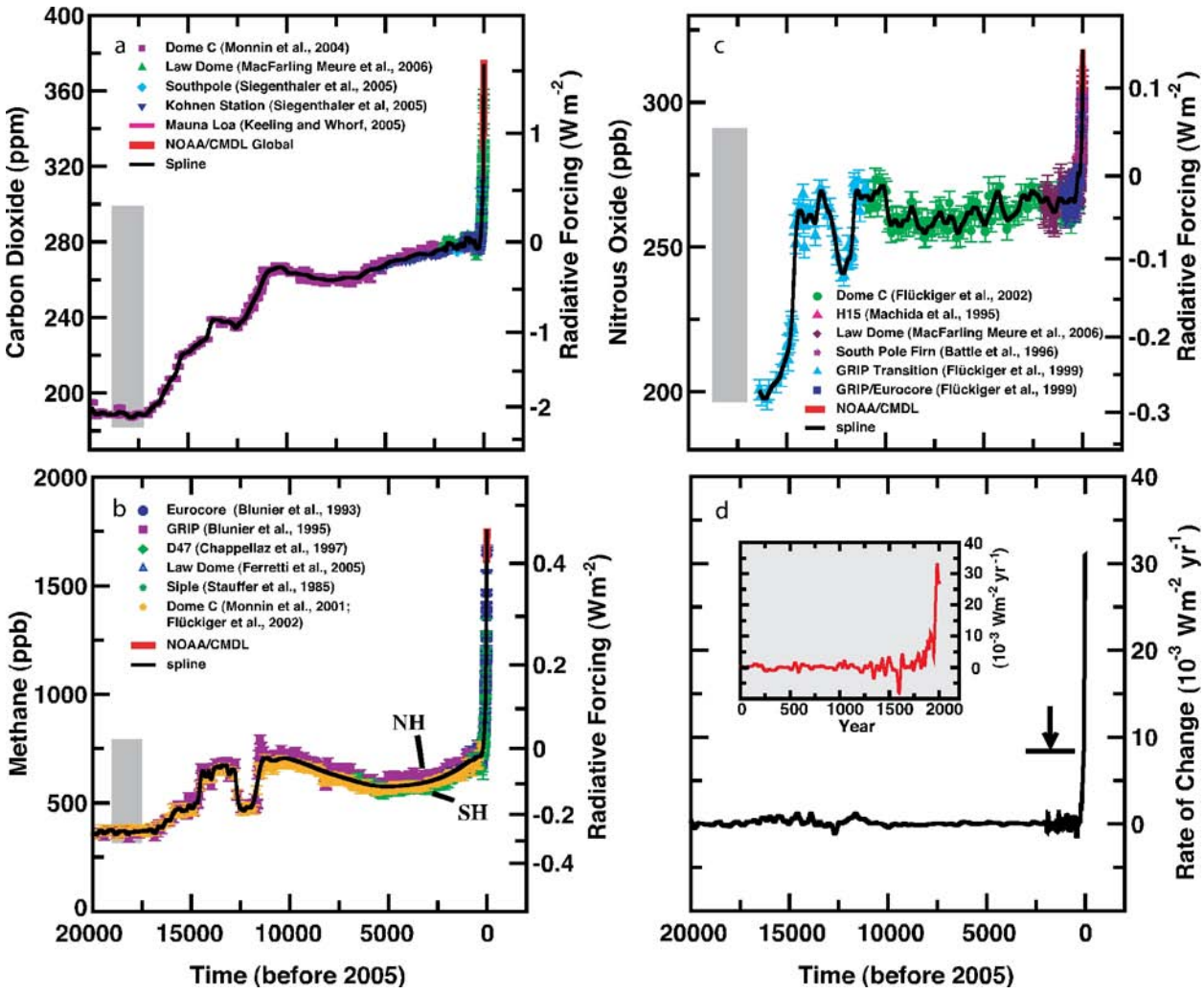

Figure 6.4. *The concentrations and radiative forcing by (a) CO2, (b) CH4 and (c) nitrous oxide (N2O), and (d) the rate of change in their combined radiative forcing over the last 20 kyr reconstructed from Antarctic and Greenland ice and firn data (symbols) and direct atmospheric measurements (red and magenta lines). The grey bars show the reconstructed ranges of natural variability for the past 650 kyr. Radiative forcing was computed with the simplified expressions of Chapter 2. The rate of change in radiative forcing (black line) was computed from spline fits of the concentration data (black lines in panels a to c). The width of the age distribution of the bubbles in ice varies from about 20 years for sites with a high accumulation of snow such as Law Dome, Antarctica, to about 200 years for low-accumulation sites such as Dome C, Antarctica. The Law Dome ice and firn data, covering the past two millennia, and recent instrumental data have been splined with a cut-off period of 40 years, with the resulting rate of change in radiative forcing shown by the inset in (d). The arrow shows the peak in the rate of change in radiative forcing after the anthropogenic signals of CO2, CH4 and N2O have been smoothed with a model describing the enclosure process of air in ice applied for conditions at the low accumulation Dome C site for the last glacial transition.* Citations deleted, AR4, Ch. 6, p. 448.

FIGURE 36

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The gray bars, representing the past 650 kyr, are from the extended Vostok ice cores, where the measured CO2 concentration ranged between 180 and 300 ppm. TAR, Figure 3.2(a), p. 201. If IPCC had shown the full reconstructed range, the gray bar for CO2 would have exceeded 6,000 ppm. *Id.*, Figure 3.2(f). These data contradict the unprecedented argument. Measured gas concentrations and proxy estimates have undergone peak-to-peak changes at least as great as those determined from modern instruments. And considering the long averaging time of ice cores, here admitted by IPCC to be in the range of 20 to 200 years, the hockey stick story loses any validity.

Furthermore with respect to CO2, ice core samples accumulate inside the cold water oceanic sinks at the headwaters for the thermohaline circulation, while the MLO record, "*the master time series documenting the changing composition of the atmosphere*", above, sits in the plume of the dominating outgassing of CO2 from the Eastern Equatorial Pacific (EEP). Changes in the mean atmospheric concentration of CO2 will measure higher at MLO than they do in polar regions because of this source-sink bias. Instead of estimating the bias, IPCC assumed it away with its well-mixed conjecture.

C. WELL-MIXED CONFUSION.

IPCC's well-mixed notion is its determination made so that gas concentrations, especially CO2 from Mauna Loa, will be global, and certainly not regional distortions from sources or sinks. It arises out of its assumption that the surface layer of the ocean is in equilibrium, causing the chemical equations of equilibrium to create a bottleneck to the dissolution of CO2. This novel back pressure on solubility causes CO2 to accumulate in the atmosphere until space is made to dissolve it in the ocean. IPCC makes the solubility pump stand in queue behind the extremely slow sequestering processes known as the organic carbon pump and the CaCO3 counter pump, collectively the biological pumps. See AR4, Figure 7.10, p. 530. To rely on the surface layer being in equilibrium, IPCC has to be blind to turbulence, currents, circulations, life processes, wave actions, wind, entrained air, and heat transfer. Nor does the Panel offer any explanation for the natural flux of CO2 proceeding apace at the rate of about 100 GtonsC/year under different solubility parameters than those it presumes for manmade CO2.

Nevertheless, under IPCC's equilibrium model for the surface layer, anthropogenic CO2 is slow to be dissolved, and when it is, it shifts the surface layer to a more acidic, less environmentally friendly, state. This is another plus for the alarmists. And while ACO2 is being slowly absorbed, atmospheric circulations cause it to become well-mixed. Then being well-mixed, IPCC can calibrate every CO2 measuring station in the network to agree with MLO. And as discussed at length in the ***Rocket Scientist's Journal***, MLO sits in the plume of the ocean's massive Eastern Equatorial Pacific outgassing, ripe to be modulated by slow changes in the lie of the plume from seasonal winds or shifts accompanying changes in processes like the Southern Oscillation.

> *The longitudinal variations in CO2 concentration reflecting net surface sources and sinks are on annual average typically <1 ppm. Resolution of such a small signal (against a background of seasonal variations up to 15 ppm in the Northern Hemisphere) requires high quality atmospheric measurements, measurement protocols and* ***calibration procedures within and between monitoring networks*** *(citations).* Bold added, TAR ¶3.5.3 *Inverse Modelling of Carbon Sources and Sinks* p. 211.

Unfortunately for the AGW movement, IPCC contradicts its well-mixed assumption in its reports:

> *The observed annual mean latitudinal gradient of atmospheric CO2 concentration during the last 20 years is relatively large (about 3 to 4 ppm) compared with current measurement accuracy. It is however not as large as would be predicted from the geographical distribution of fossil fuel burning – a fact that suggests the existence of a northern sink for CO2, as already recognised a decade ago (citations).* *Id.,* p. 210.

Clouds and streaks of CO2 are also evident in AIRS satellite mid-troposphere imagery, indicating even greater variability and more sharply defined patterns in the lower troposphere.

And of course IPCC's speculation about a northern sink for CO2 is confirmed in its Takahashi diagram. AR4, Figure 7.8, p. 523; see discussion and recalibration, ***On Why CO2 Is Known Not To Have Accumulated in the Atmosphere, etc., Rocket Scientist's Journal***, Figures 1 and 1A. That sink turns into the headwaters of the thermohaline circulation, where the water, dense from the cold and heavy with a full load of CO2, plunges to depths, emerging to outgas a millennium later mostly in the Eastern Equatorial Pacific. Carbon dioxide cannot be well-

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mixed while exhibiting gradients, lumpiness, circulations, and patterns.

D. THE FALLACY OF UNPRECEDENTED.

IPCC's hockey stick charts comprise its "unprecedented argument" by which it hopes to persuade the public that a catastrophic global warming, caused by man through his greenhouse gas emissions, is underway. It floats on a raft of logical fallacies. What is unprecedented in these records, the brief blades of the hockey sticks, cannot be said never to have happened, but only that they have yet to be sampled among a small number of widely spaced ice core samples, or are yet to be estimated from highly uncertain proxy reductions. What is unprecedented in our observations does not establish impossibilities before man. Having gases and temperatures appear to rise together is a correlation, and elementary in science is that correlation does not imply cause and effect. In the theory of causation, the lack of a correlation rules out a cause and effect, and a lagging process cannot be the cause of a leading process. Graphical appearances are not measures of correlation, much less estimates of leads and lags.

While man must be ruled out as a factor in climate pre-1750, that adds no weight to the hypothesis that he must be a cause of change post-1750. *Could be* does not imply *is*. Accepting a hypothesis by eliminating some but not all competing plausible hypothesis is an error in causality, sometimes known as the *hidden factor fallacy*. Man cannot be accepted as the cause unless the Sun is ruled out, and the Sun cannot be ruled out based on a constant albedo model until albedo is shown not to vary in some significant, dependent way, directly or indirectly, on solar activity.

E. GAS HOCKEY STICK MISUNDERSTANDING.

As a matter of physics, ice core gas records would not connect to modern instrument counterparts. The paleo records and especially the modern records are variable, but the measured variability between the two should differ by a factor of 6,000 or more. In the modern methods, technicians collect gas in a flask by sealing a sample from a continuous flow in a matter of one minute in the manual mode, or less. Ice core data are open to the air for a period reportedly as brief as 20 years, but more frequently cited to be on the order of 70 years to a millennium or two. The air in the snow has to be compressed from the weight of the snow above into firn, and then the firn compressed and frozen into ice before it can be measured in ice cores.

The time to closure depends on the rate of snow fall and other parameters, and varies by site. One authority puts the time at 20 years to 600 years (Kohler, et al. (2006), p. 528), and another puts it at more than 2000 years in central Antarctica (Readinger, C. (2006), p. 8).

> *Because bubbles close at depths of 40–120 m, gases are younger than the ice enclosing them. The gas age–ice age difference (Δage) is as great as 7 kyr in glacial ice from Vostok; it is as low as 30 yr in the rapidly accumulating Antarctic core DE 08.* Bender, et al. (1955), p. 8345.

The minimum close off period of 20 years is over 10 million minutes, and the variability in standard deviations is proportional to the square root of the relative sample size. Consequently, ice core data should have one three-thousandth, and taking Bender's Δage to be the close-off period, perhaps as little as one sixty-thousandth the variability evident in the modern record. Of course, the air before close off is not well circulated and close-off is a process of slowly decreasing porosity. Regardless, ice core data are the measure of very long term averages, while modern instrument records are relatively instantaneous. Ice core processes are an extensive low pass filter mechanism that introduces two effects: a lag, and a variance reduction. Investigators routinely take into account the lag as the ice age, but have yet to take into account the variance reduction. What is witnessed in the modern readings over a half to one-and-a-half centuries is an event that, if repeated, would be lost in the noise of ice core data.

Either the modern records all coincidentally match the multi-decade averages at the start, or someone has doctored the records to make matches where none exists. Of course if the concentrations of all these gases undergoes an increase from the same cause beginning 350 to 250 years ago, for example as from the Sun, then the records might have fortuitously merged somewhere around 1750 to 1850. However, that, too, would defeat the model that man is causing the increases.

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F. TEMPERATURE HOCKEY STICK FRAUD

The hockey stick temperature reduction met with controversy at its outset in 1998, and it now enjoys a complicated history all its own. A few times, investigators have declared it dead from one fatal disease or another, but its author, Michael Mann, has emphatically proclaimed its death to be greatly exaggerated. Contrary to the opinion of several observers, Mann denies that IPCC discarded the Hockey Stick reconstruction in its Fourth Assessment Report, but instead expanded upon it.

On 11/26/09, Mann told Daily Kos that *"Mike's Nature trick"* to *"Hide the decline"* in the purloined CRU email was a reference to the "*divergence problem*", namely that tree-ring data ran opposite to instrument data after 1960. This, he says, arose in work by Keith Briffa, and that he (Mann) was "*not directly associated with*" it. On 12/4/04 Mann had claimed a dozen reductions support his Hockey Stick, but to the contrary on 2/5/07 that the other reductions "*show no similarity to each other*".

Steve McIntyre provides an analysis of those emails, and a chronology of the events leading to IPCC's acceptance and publication of the Hockey Stick. See especially "*IPCC and the 'Trick'*", 12/10/09. http://climateaudit.org/2009/12/10/ipcc-and-the-trick/ and the links from there. McIntyre also shows evidence he uncovered in the CRU documents of a specific proxy decline that the authors deleted from one of files. "*The Deleted Portion of the Briffa Reconstruction*", 11/26/09. McIntyre's approach is prospective. Relying on the emails, he shows signs of an agreement to commit fraud by altering data to fit the doctrine. His trail of evidence includes cuttings and insertions of data, but not the publication that completes the act.

A number of critics have written about a now infamous "*fudge factor*", a comment naming a piece of code in a program intended for proxy reductions and discovered in the appropriated CRU documents. This little subroutine is not a filter to smooth data objectively, but instead is a ramp that exaggerates 20th century temperatures from tree-ring studies so that they look more like the instrument record. This by any standards is a fraud. It has met with two related but different responses from IPCC supporters. First is that the section of code is "commented out", meaning that it is tagged to prevent execution at run time. However, the same code without tags also appears among the CRU documents.

The second criticism is the more important. It is a facile denial that the program with the fudge factor was ever used in published results. If true, the code could amount to no more than a scientific experiment, a normal *what-if* analysis aiding the investigator in understanding the behavior of tree-ring reductions. If true, it would also be a complete defense against a legal charge of conspiracy where the law requires an overt act in furtherance of the agreement.

Whatever the nature of the agreement, whether by a specific piece of computer code, or simply collective acknowledgement that someone is going to jigger the data, this paper examines the published reports for evidence of the overt act. The ***Rocket Scientist's Journal*** complements McIntyre's prospective analysis, adding a retrospective or forensic view to discover from the Reports what IPCC did publish as data.

Michael E. Mann was one of eight lead authors to Chapter 2, "*Observed Climate Variability and Change*", of IPCC's Third Assessment Report, Climate Change 2001. This is the section that reported his 1999 Hockey Stick reconstruction for the past 1000 years. See Figure 33, above. Mann's reconstruction appears again in the Fourth Assessment Report, buried in a dozen other traces, now extending back 1300 years (FIGURE 37) :

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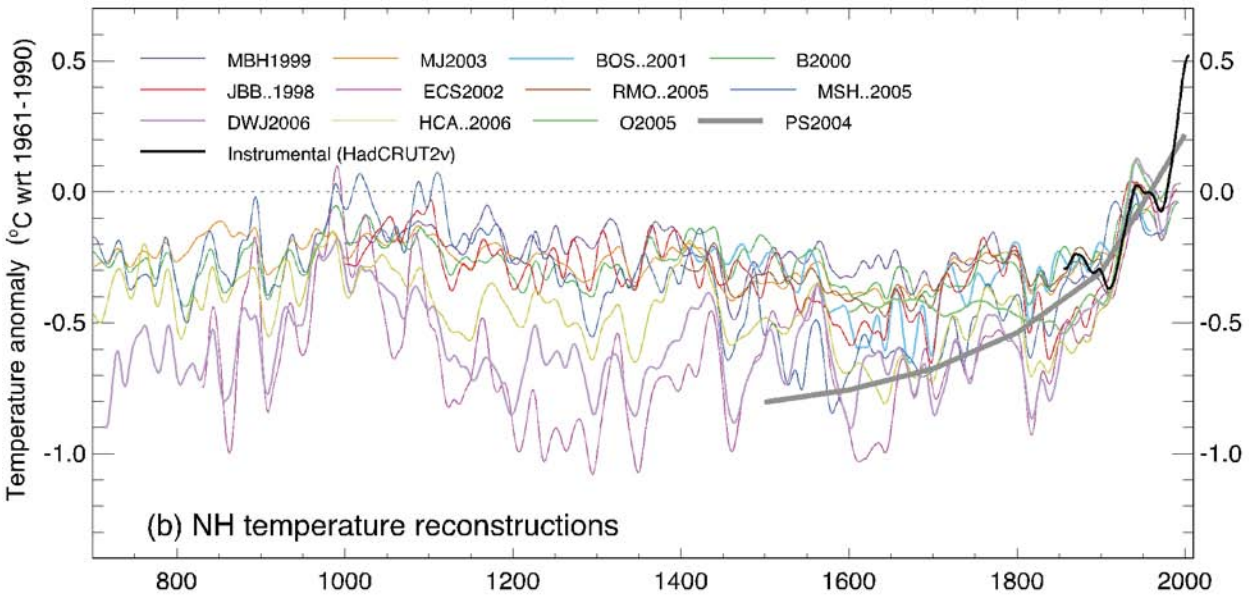

Figure 6.10. *Records of NH temperature variation during the last 1.3 kyr. ... (b) Reconstructions using multiple climate proxy records, identified in Table 6.1, including three records (JBB..1998, MBH..1999 and BOS..2001) shown in the TAR, and the HadCRUT2v instrumental temperature record in black. ... The HadCRUT2v instrumental temperature record is shown in black. All series have been smoothed with a Gaussian-weighted filter to remove fluctuations on time scales less than 30 years; smoothed values are obtained up to both ends of each record by extending the records with the mean of the adjacent existing values. All temperatures represent anomalies (°C) from the 1961 to 1990 mean.* Parts (a) and (c) deleted, AR4, p. 467.

FIGURE 37

IPCC identifies the codes as follows: HadCRUT2v, (Jones and Moberg, 2003; errors from Jones et al., 1997); JBB..1998, (Jones et al., 1998; calibrated by Jones et al., 2001); MBH1999, (Mann et al., 1999); BOS..2001, (Briffa et al., 2001); ECS2002, (Esper et al., 2002; recalibrated by Cook et al., 2004a); B2000, (Briffa, 2000; calibrated by Briffa et al., 2004); MJ2003, (Mann and Jones, 2003); RMO..2005, (Rutherford et al., 2005); MSH..2005, (Moberg et al., 2005); DWJ2006, (D'Arrigo et al., 2006); HCA..2006, (Hegerl et al., 2006); PS2004, (Pollack and Smerdon, 2004; reference level adjusted following Moberg et al., 2005); O2005, (Oerlemans, 2005). AR4, Table 6.1, p. 469.

IPCC defends its reconstructions as follows:

> *For this reason, the proxies must be 'calibrated' empirically, by comparing their measured variability over a number of years with available instrumental records to identify some optimal climate association, and to quantify the statistical uncertainty associated with scaling proxies to represent this specific climate parameter. All reconstructions, therefore, involve a degree of compromise with regard to the specific choice of 'target' or dependent variable. Differences between the temperature reconstructions shown in Figure 6.10b are to some extent related to this, as well as to the choice of different predictor series (including differences in the way these have been processed). The use of different statistical scaling approaches (including whether the data are smoothed prior to scaling, and differences in the period over which this scaling is carried out) also influences the apparent spread between the various reconstructions. ...*
>
> *All of the large-scale temperature reconstructions discussed in this section, with the exception of the borehole and glacier interpretations, include tree ring data among their predictors ... . In certain situations, this process may restrict the extent to which a chronology portrays the evidence of long time scale changes in the underlying variability of climate that affected the growth of the trees; in effect providing a high-pass filtered version of past climate. However, this is generally not the case for chronologies used in the reconstructions illustrated in Figure 6.10. Virtually all of these used chronologies or tree ring climate reconstructions produced using methods that preserve multi-decadal and centennial time scale variability. ... Figure 6.10b illustrates how, when viewed together, the currently available reconstructions indicate generally greater variability*

> *in centennial time scale trends over the last 1 kyr than was apparent in the TAR. It should be stressed that each of the reconstructions included in Figure 6.10b is shown scaled as it was originally published, despite the fact that some represent seasonal and others mean annual temperatures. Except for the borehole curve (Pollack and Smerdon, 2004) and the interpretation of glacier length changes (Oerlemans, 2005), they were originally also calibrated against different instrumental data, using a variety of statistical scaling approaches.* AR4, ¶6.6.1.1 *What Do Reconstructions Based on Palaeoclimatic Proxies Show?*, pp. 472-3.

IPCC admits that it used "'*calibration*'" to make the reconstructions agree, and specifically to agree with the instrumental data. It admits that some of its reconstructions were in effect high pass filters, meaning that they measure the variability and not the mean of temperature. It denies that this was true of all the traces, but on the other hand claims no more than that the records preserved variability on certain scales. The authors of each reconstruction scaled and shifted their data by a process called calibration to match the instrument record.

IPCC said,

> *With the* ***development of multi-proxy reconstructions****, the climate data were extended not only from local to global, but also from instrumental data to patterns of climate variability. Most of these reconstructions were at single sites and only loose efforts had been made to consolidate records.* ***Mann et al. (1998) made a notable advance in the use of proxy data by ensuring that the dating of different records lined up****. Thus, the true spatial patterns of temperature variability and change could be derived, and estimates of NH average surface temperatures were obtained.* Citations deleted, bold added, AR4, ¶1.4.2 *Past Climate Observations, Astronomical Theory and Abrupt Climate Changes*, p. 107.

But when Mann's Hockey Stick reconstruction (TAR Figure 2.20, p. 134) came under criticism (AR4 ¶6.6.1.1 *What Do Reconstructions Based on Palaeoclimatic Proxies Show?*, p. 466), IPCC retained it, but buried in the *spaghetti graph* of 11 other reconstructions as if those reconstructions validated Mann's. Why didn't IPCC follow Mann's "*notable advance*" by creating a single, super multi-proxy reconstruction out of the 11 others? Here's how that appears as an average with equal weights:

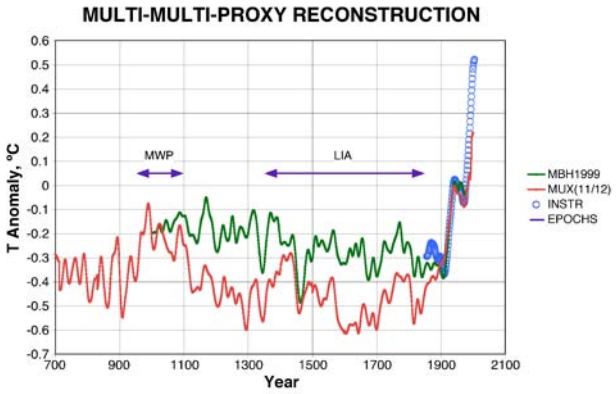

FIGURE 38

The green trace is the problematic Mann Hockey Stick. In red is the average of the other 11 reconstructions. The blue circles are the instrument record. The other reconstructions, sharpened by averaging, reflect the Medieval Warm Period (980-1100) and reflect the Little Ice Age (1350-1850). On the other hand, the other constructions collectively contradict Mann's reconstruction, criticized at the outset for erasing the WMP and the LIA, and they individually reinforce the suspicion that investigators arbitrarily fastened the instrument record onto the end of every reconstruction.

Should these proxy data actually measure a Medieval Warm Period, honors would be due the investigators for a scientific breakthrough. IPCC treats the MWP (and for that matter the Little Ice Age (LIA), as well) as anecdotal, or even apocryphal, referring to it in quotation marks, "the '*Medieval Warm Period*'", and as the "*so-called Medieval Warm Period*" (AR4 ¶6.6.1.1, p. 466). IPCC credits Lamb (1965) for coining the phrase MWP, then describes his work as lacking precision, predating formal statistical methods, and based on evidence difficult to interpret. AR4 Box 6.4: *Hemispheric Temperatures in the 'Medieval Warm Period'*, p. 468. It concludes,

> *A later study, based on examination of more quantitative evidence, in which efforts were made to control for accurate dating and specific temperature response, concluded that it was not possible to say anything other than '... in some areas of the Globe, for some part of the year, relatively warm conditions may have prevailed'. Id.*

IPCC here asserts that the MWP was not quantified originally, nor even in later studies.

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However, IPCC describes the multi-proxy reconstructions as containing data from *"terrestrial (tree ring, ice core and historical documentary indicator[s]) and marine (coral)"* sources, *"calibrated against dominant patterns of 20th century global surface temperature"*, including boreholes, in one instance using *"largely independent data"*. TAR, ¶2.3.2.2 *Multi-proxy synthesis of recent temperature change*, p. 133. With respect to the MWP, the historical documentary indicators are not quantitative. Consequently, to the extent that historical indicators of the MWP influenced the multi-proxy reconstructions, the results would be contaminated by investigator subjectivity.

The concept of a proxy seems easily understood, but difficult to define. IPCC says a proxy is a measurement by which the value of a parameter is inferred through a model.

> *A climate proxy is a local quantitative record (e.g., thickness and chemical properties of tree rings, pollen of different species) that is interpreted as a climate variable (e.g., temperature or rainfall) using a transfer function that is based on physical principles and recently observed correlations between the two records.* AR4 ¶1.4.2 *Past Climate Observations, Astronomical Theory and Abrupt Climate Changes*, p. 106.

The word *local* is superfluous, as is the notion of the correlation, recently observed or not, which is logically and historically incorporated in the transfer function. The problem with this definition is that an ordinary mercury thermometer is a proxy instrument for temperature. This is not what IPCC intended when it made the following distinction:

> *To place the current* ***instrumental*** *observations into a longer historical context requires the use of proxy data (Section 6.2)*. Bold added, AR4, ¶1.3.2 *Global Surface Temperature,* p. 102.

However IPCC does not merely put the modern instrument record into the longer context but distorts the longer context to meet the modern record. It destroys the boundary of context by bending every one of the 12 reconstructions to fit smoothly into the instrument record.

The failure of a reconstruction might be due to arbitrary weights the investigator assigned to the various proxy sources, or perhaps to his calibration method. IPCC doesn't provide enough information to reproduce its results.

IPCC says,

> *In practice, contemporary scientists usually submit their research findings to the scrutiny of their peers, which includes disclosing the methods that they use, so their results can be checked through replication by other scientists. ...*
>
> *The attributes of science briefly described here can be used in assessing competing assertions about climate change. ... The IPCC assesses the scientific literature to create a report based on the best available science (Section 1.6). It must be acknowledged, however, that the IPCC also contributes to science by identifying the key uncertainties and by stimulating and coordinating targeted research to answer important climate change questions.* AR4, ¶1.2 *The Nature of Earth Science, p. 95.*

The IPCC Reports are among the exceptions to its conclusion about contemporary scientists. Those Reports do not include data for, or links to, either calibration data or specific proxy data used in any of the reconstructions. IPCC's science is not amenable to testing even with major research and a sizable purchase of references.

IPCC investigators forced these dozen reconstructions to overlie one another by mean shifting and variance scaling. Since IPCC offers these traces as reconstructions of the same temperature from the same time period, the reconstructions should share patterns. In particular they should exhibit a pattern related to temperature as well as to other, confounding patterns related to processing.

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The construction of synthetic records reveals and helps identify patterns due to signal, noise, and processing. Here is an example of two such records:

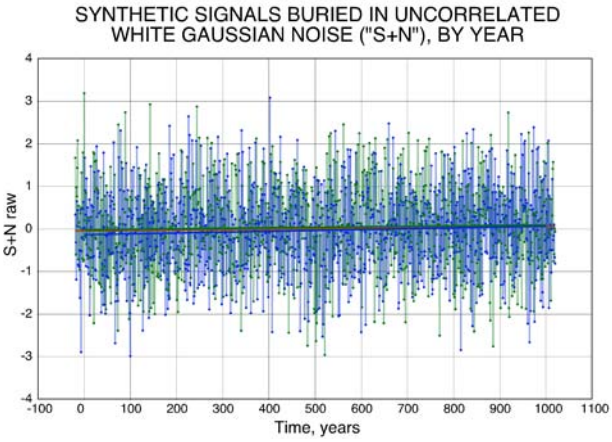

FIGURE 39

The signal in this synthesis is a simple ramp representing a tenth of a degree per 1000 years, and is shown in brown. End effects, which always require special care in analysis of real data, vanish by padding the synthetic signal and noise through extension of the records 20 years beyond the analysis domain at each end. The records consist of the signal with two added series of uncorrelated, white Gaussian noise. The signal to noise ratio happens to be -30 db, but the power and shape at such low levels are irrelevant. The records are the blue and green samples, faintly connected with straight lines, and with the best linear fits included in bright colors.

Low pass filtering of each synthetic record is next, as occurs in most measuring. Sensing energy or matter requires a collection time, even to count events. The filter applied is the elementary single pole filter, called an *alpha-filter* with $\alpha = 0.93$. It is a causal filter. At this point, the bandwidth of the filter is relevant, but not its shape. The result is shown in the next figure.

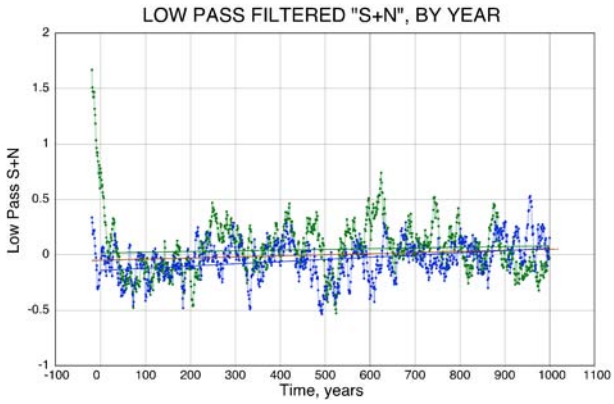

FIGURE 40

This initial filter brings out the signal, which was evident on close inspection of even the raw records. High frequency noise remains obvious, but sharply reduced in amplitude (the variance reduction ratio). Note the change in scale, and that the trends only approximate the signal. Next is Gaussian filtering in the IPCC fashion. Not being a causal filter, it's value is primarily subjective.

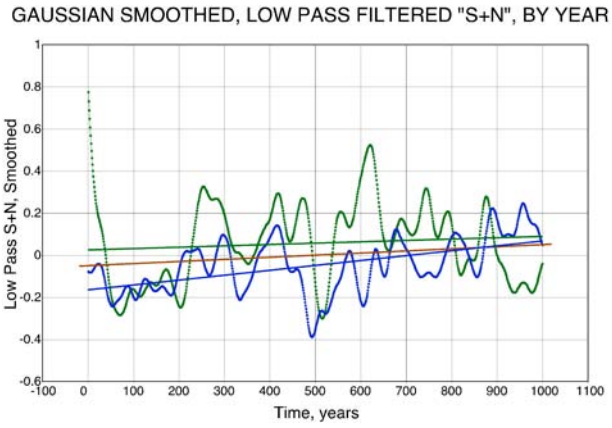

FIGURE 41

Note again the changes in the scaling and in the trends.

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Correlation, and in particular the cross-correlation function, would be a standard statistical technique for measuring how well such proxies match one another, and hence how well they might represent the temperature they are supposed to measure. Raw records are not available, and IPCC's smoothing causes the cross-correlation function to be masked by the dominant effects of the smoothing filter.

Another of an abundance of techniques is analysis of pairwise behavior beginning with a graph known as a scatter diagram. It is useful where two or more records rely a common parameter, such as time or space, and rely in a way to yield coincident samples. Then cross-plotting one record against the other produces the diagram.

IV. SIGNAL ANALYSIS

A. SYNTHETIC SIGNAL ANALYSIS

Analysis of a pair of synthetic signals with known characteristics helps calibrate the method.

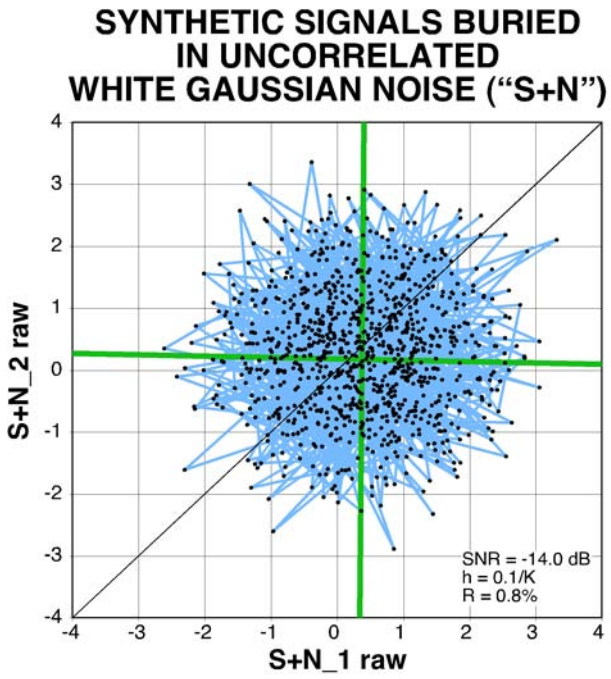

FIGURE 42

In this figure, the signal-to-noise ratio (SNR) is set to -14 dB to fit the real data analyzed below. The signal is a ramp of height 0.1 over 1000 samples representing years. This ramp is much greater than the handle of Mann's hockey stick, for example. Light blue lines connect consecutive pairs of points. The resulting starburst pattern features sharp corners, showing the unpredictability of the location of the next sample, hence the uncorrelated nature of the noise. The two green lines are full record trends, symbolized by y(x) and x(y). The product of the slopes of the lines is always dimensionless, and its value is the coefficient of determination, R^2, pronounced "R squared", where R is the correlation coefficient. Because the lines are nearly at right angles, the two records are only slightly correlated (R = 0.8%), and hence neither record is a good predictor of the other. To preserve the crossing angle and the geometry of the cluster, the graph is constructed as a square, emphasized by the line y = x lying at about a 45º angle. The trends cross at the means of each record, which is close to zero, which shows the low signal to noise ratio when compared to the diameter of the starburst. A ramp of zero slope is equivalent to no signal.

In the next scatter diagram, the same two synthetic signals in noise passed through identical low-pass filters. Low-pass filtering might be applied by the investigator to improve the signal to noise ratio, but it is also a natural consequence of measurement and of real objects. The collection time for instruments is on the order of one minute, for tree rings about one year, and for ice core records, a couple of decades to over a millennium.

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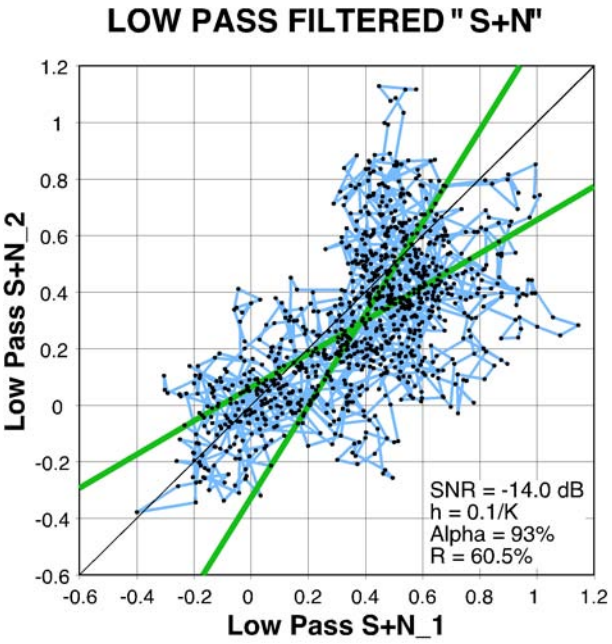

FIGURE 43

Low pass filtering improved the output signal-to-noise ratio, stretching the cluster of data in the direction of the 45 degree line, and narrowing the trend lines corresponding to R = 60.5%. For the identical synthetic records at -30 dB, the raw correlation coefficient was 3.7%, and improved by low pass filtering to 14.4%. The increase in correlation is evident in the angular loopiness of the scatter trace.

Next the two records received 41-point Gaussian filtering.

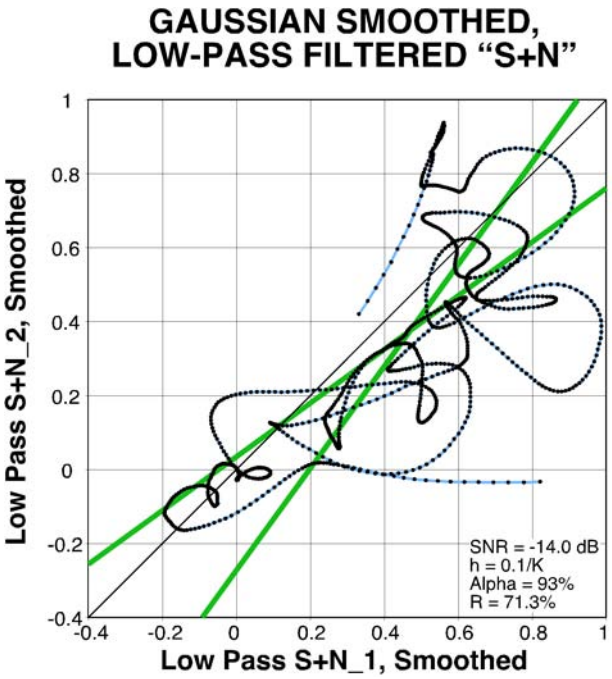

FIGURE 44

Gaussian smoothing increased the size and smoothness of the loops. The correlation improved somewhat (60.5% to 71.3%), and the diagram stretched further along the forty-five, all indications of an improvement in output SNR. The filtering also produced an acceleration effect approaching both ends of the trace. The movement of the trace is predictable in a short term relative to the filtering bandwidth, but still wanders randomly in the longer run. With two stages of filtering, the shotgun pattern of the raw signals turns into a squirt gun pattern moving up and to the right.

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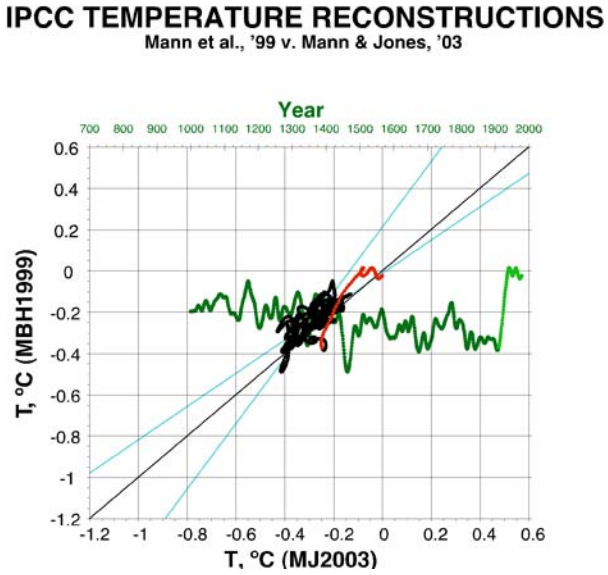
B. REAL SIGNAL ANALYSIS

The results of the synthetic signal analysis provide an understanding of the real signals. Next is the scatter diagram for Mann's Hockey Stick compared to the long record of Mann & Jones, 2003, as published in the Fourth Assessment Report.



Mann's Hockey Stick Reconstruction Compared to Mann & Jones 2003 Reconstruction.

FIGURE 45

The swirling pattern is shown in black prior to 1910 and red thereafter. The loopiness is obvious now without connecting the dots and cluttering the diagram. The trace in two shades of green is the time record of the ordinate, here Mann's Hockey Stick, dark green for the handle and light green for the blade, fully formed by 1910. The blue regression lines apply to the records only before 1910. The records are substantially correlated with R = 71.3%, the figure used in the synthetic records, and indicative of a signal-to-noise ratio of -14 dB for raw data, where signal means some combination of temperature and shared data sources. The loopiness is characteristic of heavy filtering.

After about 1910, the loopiness all but vanishes, and the pattern switches from incoherent to coherent. The red dots are still visible, now shown connected. Coming out of the last loop, the records jointly head for the future high temperatures of the instrument record. IPCC's records are preposterously prescient. The dots move further apart showing an acceleration in anticipation of the future. This acceleration was evident as an end effect in the synthetic signal analysis, but in the real records it is a transition effect, suggesting separate Gaussian filtering of the proxy data before appending the instrument record.

The comparison of the reconstructions reveals two distinct patterns. The first before 1910 agrees with a low signal to noise ratio model, where the signal might be temperature or a shared data source. The second after 1910 is the instrument record, somewhat altered, but unlike the tree-ring reductions from the preceding 12 centuries.

The transition is from a very low signal-to-noise ratio of about -14 dB to a extremely high signal-to-noise ratio that measures about +30 dB. The data processing was substantially different before 1910 than it was afterwards, suggesting a switch from proxy calculations to fudging or dry-labbing.

1. STRONG CORRELATION.

The strong correlation of 71.3% could be an artifact of the data processing, or the result of a common data source shared by the two reductions. The common cause might be proxy records used by both Mann et al. (1999) and Mann & Jones (2003) in their reductions. Or the common cause might actually be Earth's global average surface temperature, as IPCC claims. Two are possible, and the third is improbable.

The data records 1999 and 2003 records above are typical of all the records in that the investigators scaled and shifted the multi-proxy reductions to blend smoothly into the appended instrument record. Having the proxy part match the instrument part in amplitude and slope where they meet is a highly improbable coincidence. It is not credible once, much less for all 12 multi-proxy reconstructions. The investigators or later editors shifted and scaled every multi-proxy record causing each to be correlated with the instrument record.

As a usual consequence of measurement, the last of the proxy records should have a step to the beginning of the instrument record, and a discontinuity in slope. Scaling would serve to minimize the slope change, and shifting, the step. The trick is to shift and scale so that the discontinuities are small enough to be erased by a smoothing filter mild enough to preserve some character to the reconstructions.

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The fact that the graphs become coherent, beginning in anticipation of the future, is a result of investigator filtering with what is called an unrealizable filter. A realizable or causal filter is one that does not look into the future, and so could be applied to data in real time. Neither tree-rings nor climate can anticipate the future.

2. NON-CAUSAL FILTERING

IPCC frequently uses n-point filters symmetric about the instant position, and hence produces an unrealizable result. For its temperature records in Figure 6-10(b) (Figure 37, above), it applied *"a Gaussian-weighted filter to remove fluctuations on time scales less than 30 years"*. AR4, Figure 6-10 caption, p. 467. IPCC describes two smoothing filters with weights of 1-2-3-2-1 and 1-6-19-42-71-96-106-71-42-19-6-1. AR4, Appendix 3.A, p. 336. The problematic fudge factor filter discovered in the e-mails is not directly of this class, so is not implicated. Some of IPCC's filters are obviously symmetric, and without introducing a rather meaningless lag, they bring future data into the present to change what was measured. They are mostly of subjective value, good for marketing to policymakers, but not for science.

Real world patterns are the essence of scientific discovery, and often produce some of the most productive scientific models. But so are events, rare occurrences that break expected patterns, like distorted sunspot cycles or switching of the thermohaline circulation. Smoothing can reveal real world patterns, or produce them where none of any significance exists. Smoothing may aid discovery of events, but may destroy their traces in the measurements. Modeling the causes and behavior of stock market crashes is an exercise in futility if the stock index is overly smoothed.

Causation by reason, and almost by definition, rules out the future. Scientific models embody everything known about cause and effect. A valid scientific model and science can rely neither on the supernatural nor the crystal ball.

3. PAIRWISE COMPARISONS OF TEMPERATURE RECONSTRUCTIONS.

The scatter diagram above between Mann's Hockey Stick and Mann & Jones 2003 reconstruction is typical of all 12 reconstructions, whether compared with Mann & Jones long record, or with the short instrument record. (The 2005 reconstruction by Moberg et al. is somewhat exceptional.) These two sets of 13 graphs, which includes the instrument record, are shown in the following 26 figures drawn to the same scale to accommodate the largest variability in the set.

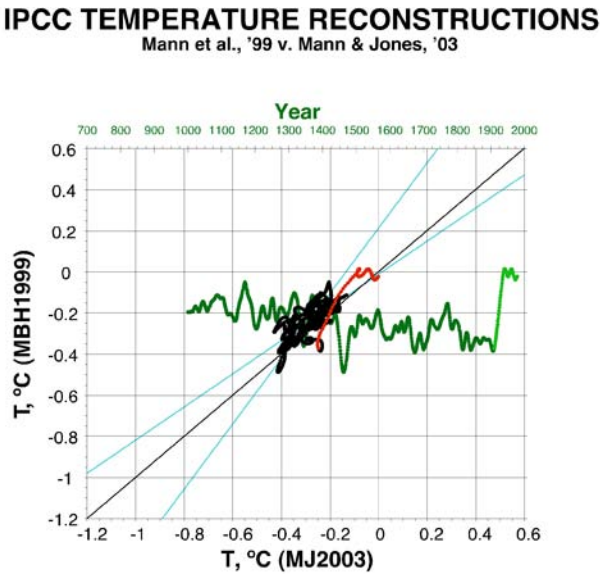

FIGURE 46

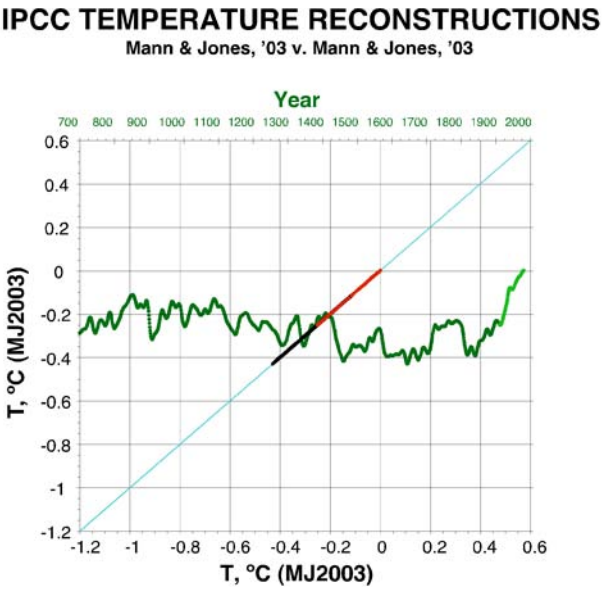

FIGURE 47

The comparison of a reconstruction with itself shows how the method responds to perfect correlation.

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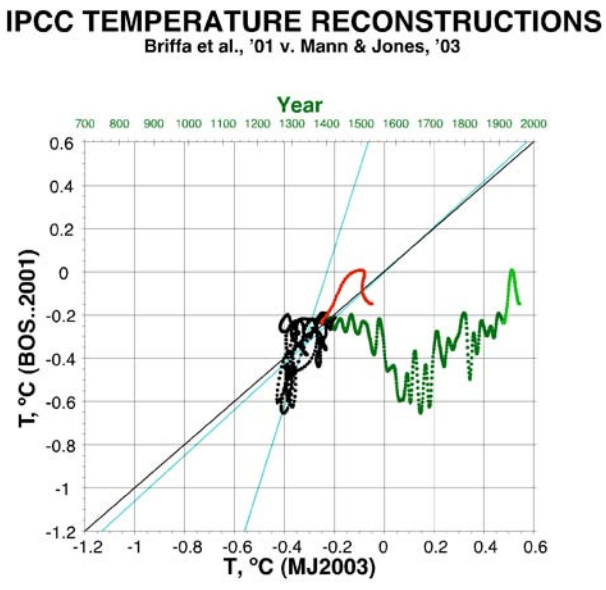

FIGURE 48

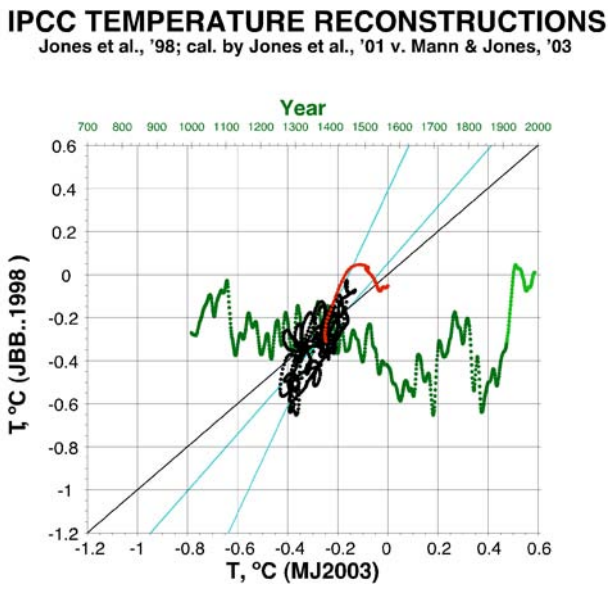

FIGURE 50

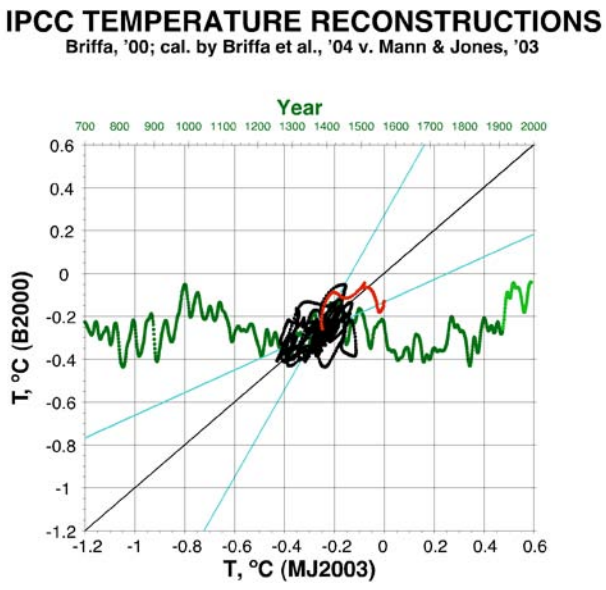

FIGURE 49

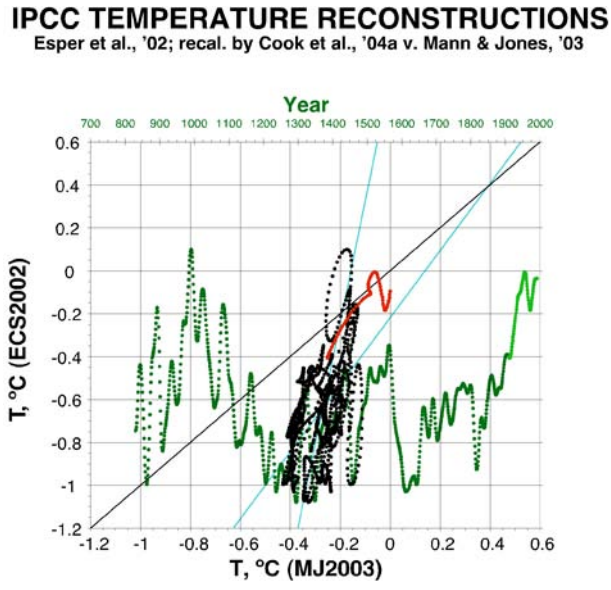

FIGURE 51

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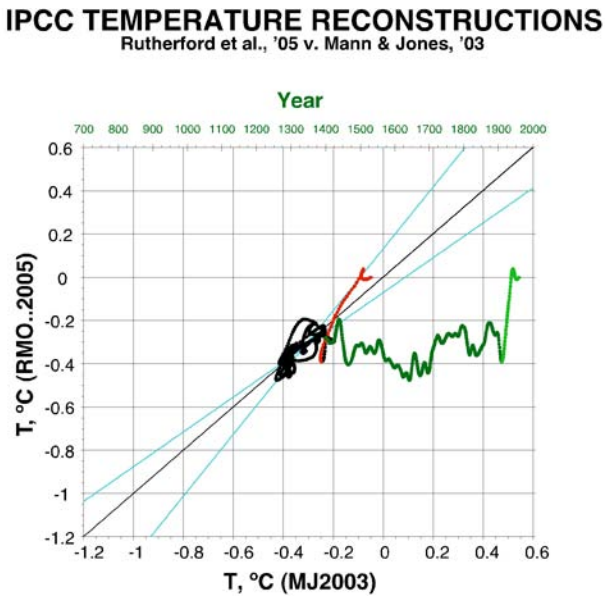

FIGURE 52

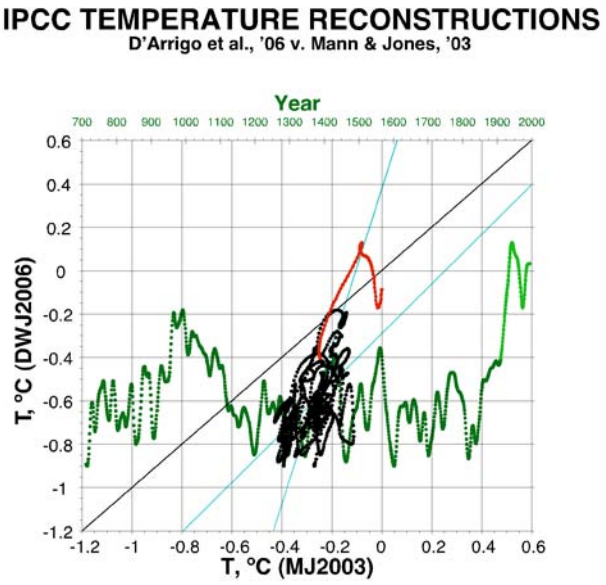

FIGURE 54

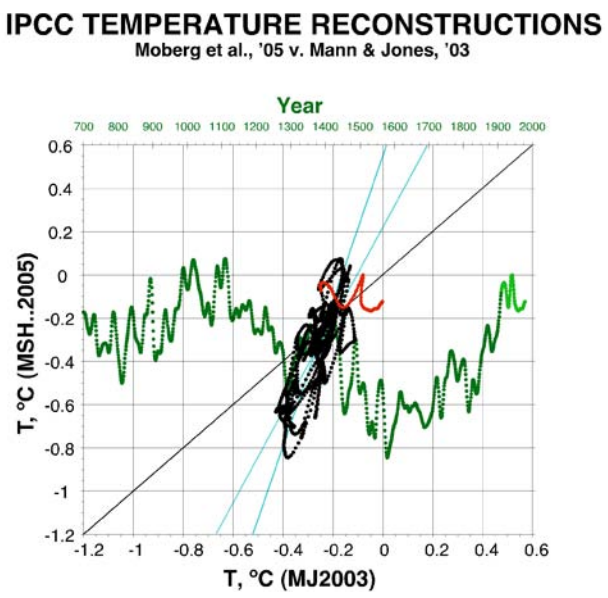

FIGURE 53

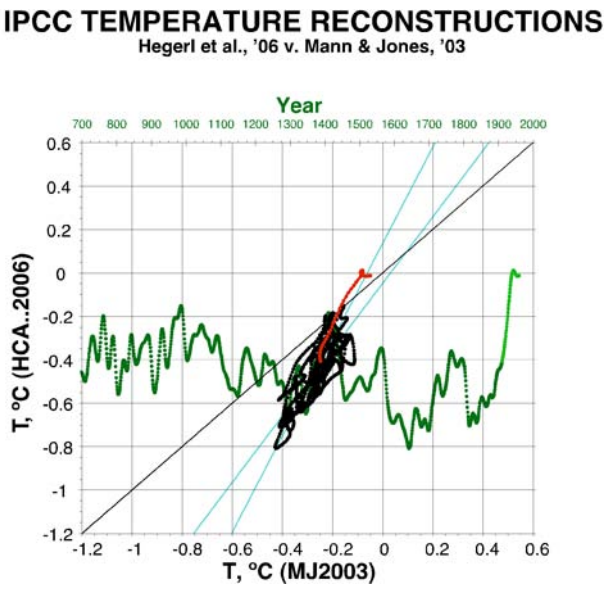

FIGURE 55

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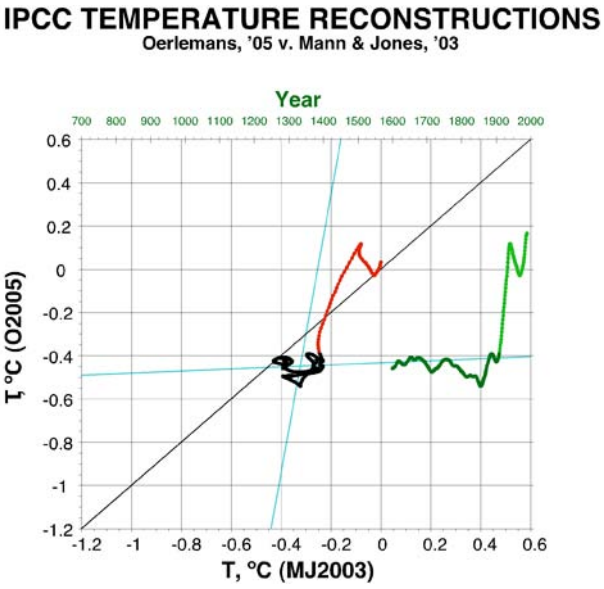

FIGURE 56

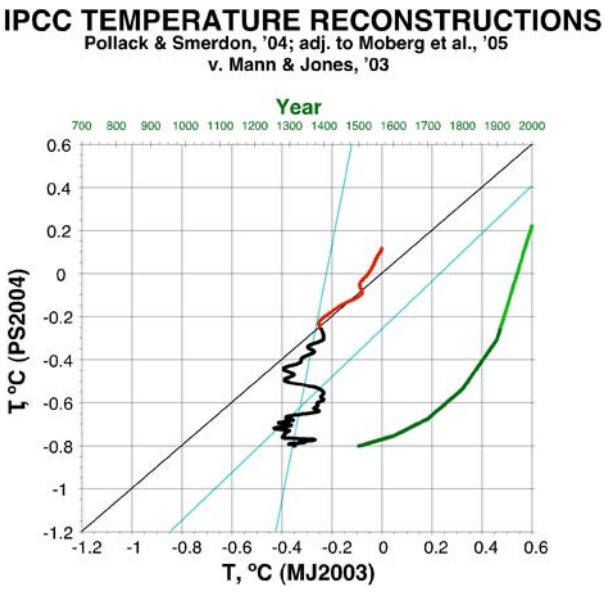

FIGURE 57

4. COMPARISONS OF TEMPERATURE RECONSTRUCTIONS TO INSTRUMENTAL RECORD.

Finally for reference, here are comparisons of each of IPCC's reconstructions compared with the instrument record of the last century and a half.

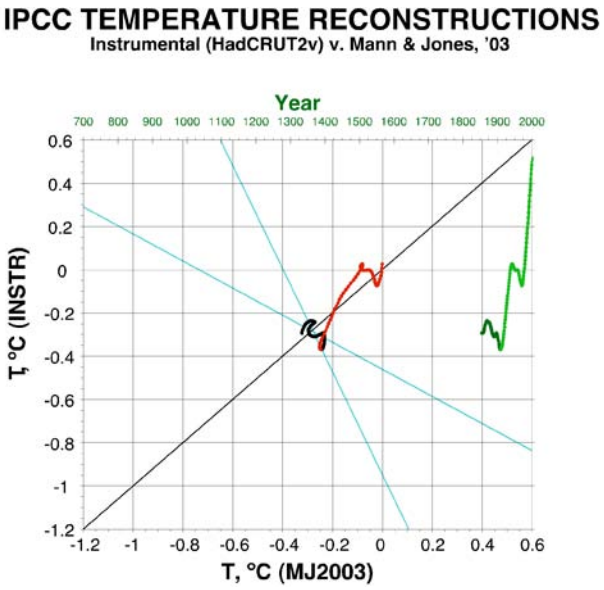

FIGURE 58

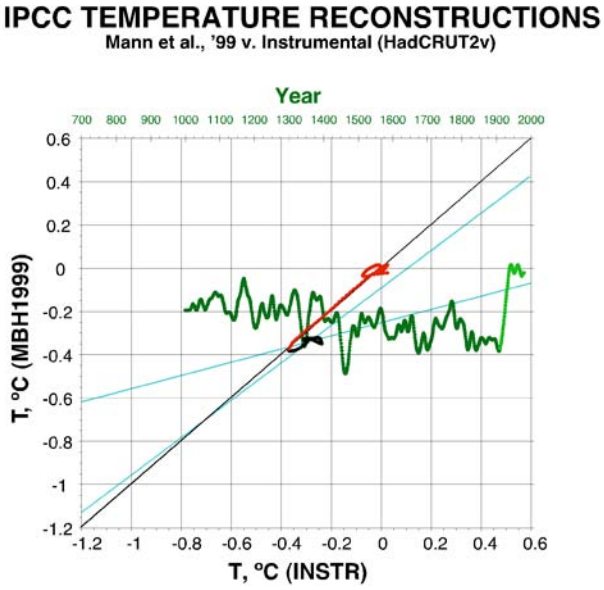

FIGURE 59

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IPCC TEMPERATURE RECONSTRUCTIONS
Instrumental (HadCRUT2v) v. Instrumental (HadCRUT2v)

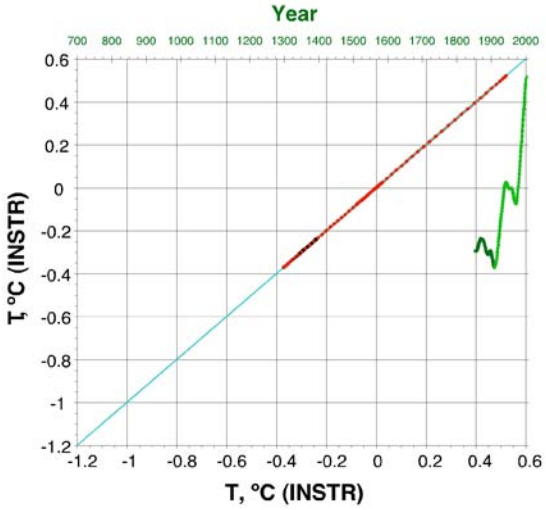

FIGURE 60

IPCC TEMPERATURE RECONSTRUCTIONS
Briffa, '00; cal. by Briffa et al., '04 v. Instrumental (HadCRUT2v)

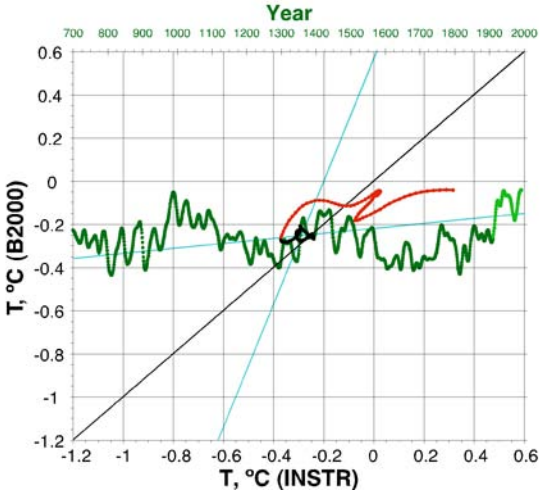

FIGURE 62

IPCC TEMPERATURE RECONSTRUCTIONS
Briffa et al., '01 v. Instrumental (HadCRUT2v)

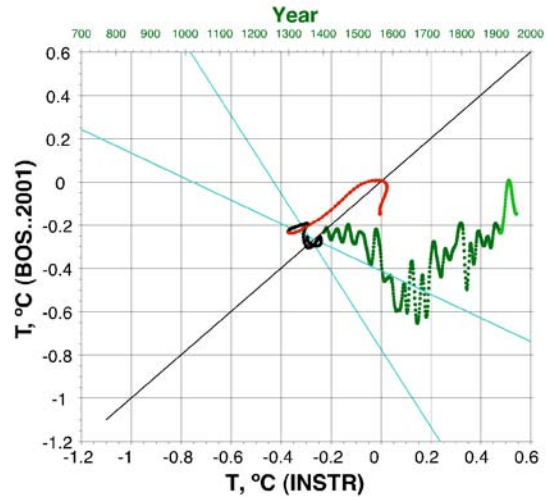

FIGURE 61

IPCC TEMPERATURE RECONSTRUCTIONS
Jones et al., '98; cal. by Jones et al., '01 v. Instrumental (HadCRUT2v)

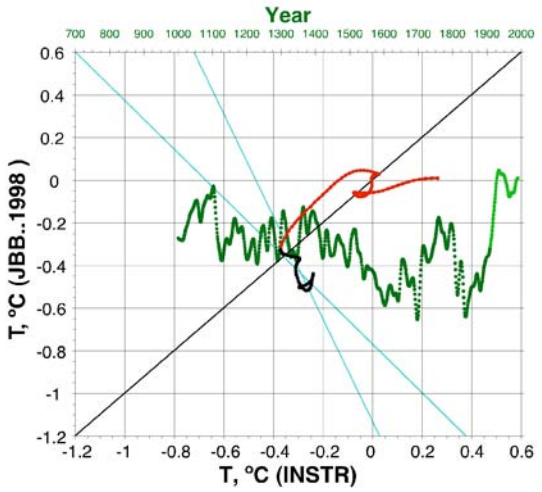

FIGURE 63

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IPCC TEMPERATURE RECONSTRUCTIONS
Esper et al., '02; recal. by Cook et al., '04a v. Instrumental (HadCRUT2v)`

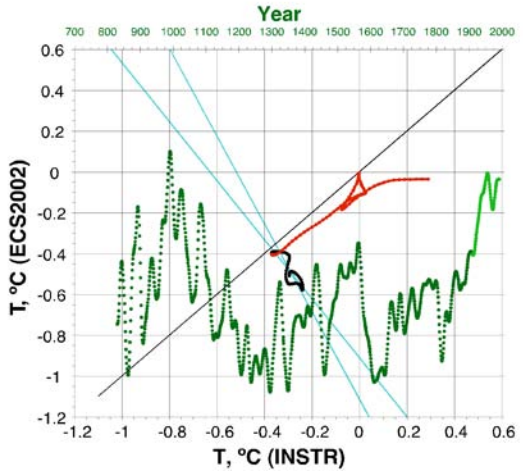

FIGURE 64

IPCC TEMPERATURE RECONSTRUCTIONS
Rutherford et al., '05 v. Instrumental (HadCRUT2v)

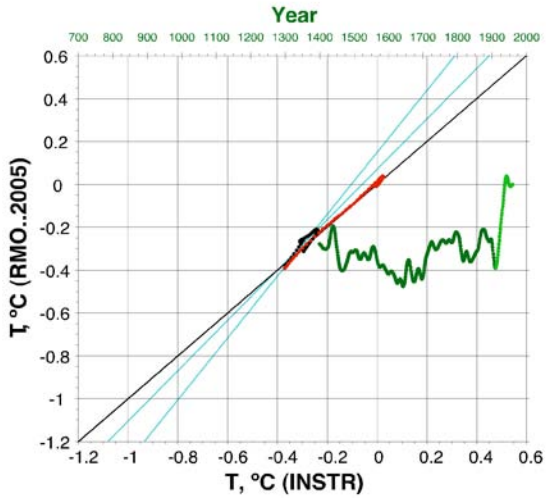

FIGURE 65

IPCC TEMPERATURE RECONSTRUCTIONS
Moberg et al., '05 v. Instrumental (HadCRUT2v)

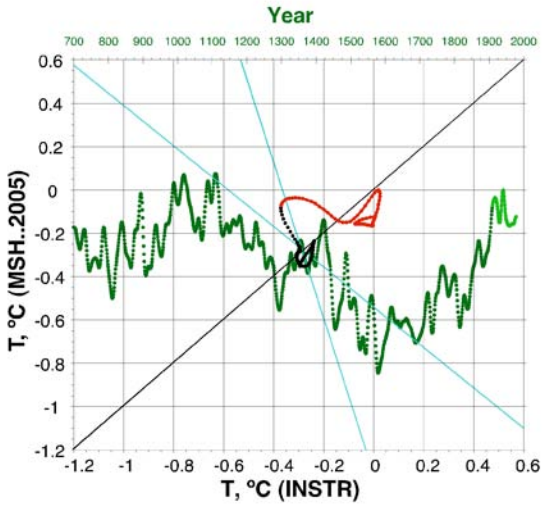

FIGURE 66

IPCC TEMPERATURE RECONSTRUCTIONS
D'Arrigo et al., '06 v. Instrumental (HadCRUT2v)

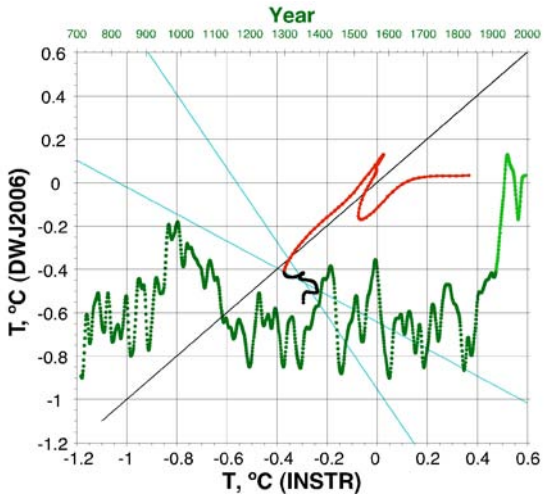

FIGURE 67

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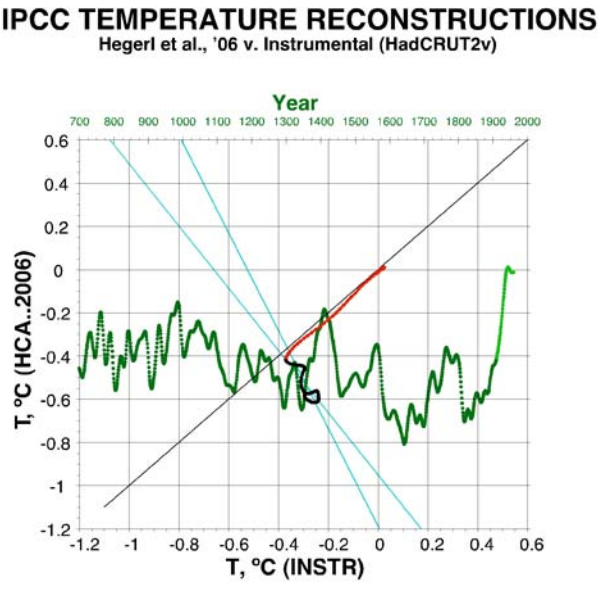

FIGURE 68

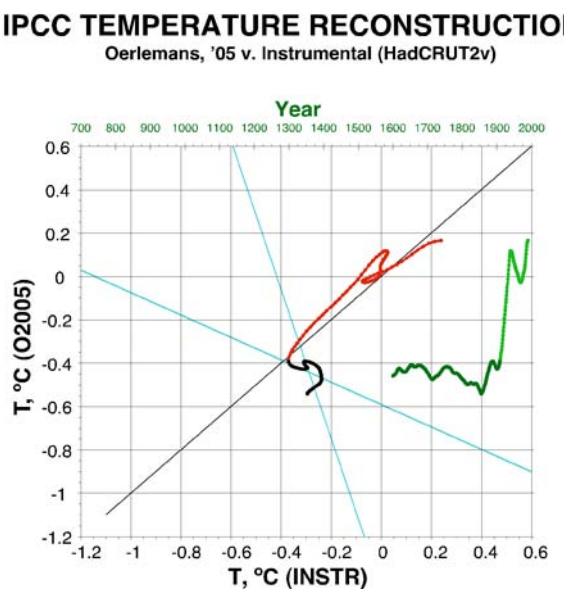

FIGURE 69

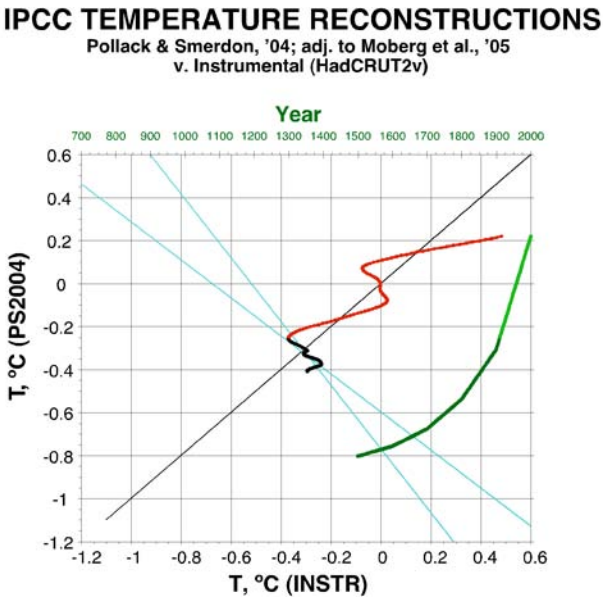

FIGURE 70

All 12 reconstructions are coherent with the temperature instrument record, indicating that the reconstructions are biased by inclusion of the instrumental record. Any information the tree-ring proxy reconstructions might have produced about Earth's temperature was destroyed when the means were shifted and the variance scaled. What is left in the spaghetti graph is indistinguishable from a millennium of noise smoothly blended into the modern record of the last 150 years or so.

In trying to defend Mann's Hockey Stick, IPCC has provided evidence that proxy reconstructions relying on tree ring data provide no valid temperature data.

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V. CONCLUSIONS

A. SOLAR RADIATION PATTERN MATCHES EARTH'S TEMPERATURE

The imprint of the Sun is on Earth's climate. The signal is unusually strong among the class of all climate signals, matching the entire record of global average surface temperature based on data from instruments. The imprinted signal is not visible in the broadband, Total Solar Irradiation model, but can be seen by filtering, much as spectral analysis reveals significant sinusoidal frequency components. And what is significant depends not on the source – the Sun -- but on the receiver – Earth. Moreover, because the problem is thermodynamic, and the medium, heat, has capacity but not inertia, temperature will not contain natural frequencies to resonate with a source.

B. EARTH'S NATURAL RESPONSES DICTATE WHAT IS IMPORTANT FROM THE SUN.

The ocean dominates the natural climate processes on Earth, and its three dimensional currents have the effect of storing and releasing energy and gases after a number of finite delays. According to this model, Earth should selectively reinforce and suppress finite delays within the structure of solar radiation. Application of the most elementary finite-time filter, the fixed time, running trend, reveals a pair of components of solar radiation, one major (S_{134}) and one minor (S_{46}), that combine linearly in the ratio of 5:1 to match Earth's temperature history as known by instruments.

C. SIGNAL SELECTION & AMPLIFICATION.

For the conclusions reached in this paper, the energy in S_{134} is sufficient by itself. However, it is not sufficient as a radiative forcing were it to be received at the surface of Earth to have a measurable affect on climate. However, the accuracy of the model in matching Earth's temperature record indicates that an amplifying process must operate on solar radiation.

1. ALBEDO AMPLIFICATION

The obvious choice for the amplifier of solar radiation is cloud albedo, neglected in GCMs, but easily shown to be the most powerful temperature feedback in Earth's climate. Furthermore, the conventional model for Earth's radiation budget contains open-loop processes known to affect the extent of cloud cover, and hence cloud albedo. Most significant among these processes is atmospheric absorption of incoming solar radiation. This absorption affects the temperature lapse rate to warm the atmosphere, but heretofore climate studies did not apply this short wave effect to the extent of cloud cover. The model advanced for Earth's variable response to solar radiation is empirical, but requiring few coefficients to match the long records of temperature on Earth to appropriately filtered solar energy.

2. FAST & SLOW ALBEDO FEEDBACK

In consideration of all the processes and observations, cloud albedo must be modeled with both a fast reaction, positive feedback, and a slow reaction, negative feedback. The fast reaction is a positive feedback with respect to solar insolation, amplifying variations in solar radiation as it imparts energy to Earth's surface, including the surface layer of the ocean. The slow reaction is a negative feedback with respect to surface temperature. It operates through the increase in humidity that accompanies a rise especially in ocean surface layer temperature. The fast reaction amplifies TSI, while at the same time the slow reaction mitigates warming, including that from the TSI it amplified.

Not recognized by IPCC is that feedback exists with respect to a flow variable. This fact is not even recognizable within IPCC's radiative forcing paradigm because it has no flow variables. Consequently, IPCC models feedback loops as correlations between variables (e.g., TAR Figures 7.4, 7.6, 7.7, & 7.8, pps. 439, 445, 448, & 454 respectively), and not as confluences in energy, mass, or information flow between sources external and internal to the system. Cloud albedo fast response operates on short wave radiation directly through the parameter of the temperature at cloud level. Cloud albedo slow response operates on surface temperature indirectly through the parameter of humidity, especially as released by the ocean.

D. CLIMATE CHANGE IS NOT ANTHROPOGENIC.

On the scale of the instrumental record of Earth's surface temperature over the last 160 years, humans have had no effect, and the Solar Global Warming model advanced here would predict none. To the extent that IPCC might presume that human activities have altered Earth's temperature record, the effect is imaginary, absent some sentient extraterrestrial force that managed to keep the Sun synchronized with Earth's average surface temperature.

IPCC claims to have evidence of the fingerprint of man on Earthly gas and temperature processes are unsubstantiated. Each has a basis in graphical trickery.

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Two of these claims falsely demonstrate relationships known mathematically: the rate of CO2 increase compared to the rate of O2 decrease, and the rate of fossil fuel emissions compared to the rate of decrease in the isotopic weight of atmospheric CO2 based on mass balance principles. Other claims rely on investigator-manufactured data from ancient records blended into modern records, where the former are averages by a process requiring a year to centuries, while the latter are relatively instantaneous. The records requiring a year are tree ring reductions, while the others are measurements from ice cores that average gas concentrations over a range of couple of decades to a millennium and a half.

E. GREENHOUSE GASES DO NOT CAUSE CLIMATE CHANGE.

Just as the Earth's temperature record following the Sun eliminates humans from the climate equation, so is the fate of the greenhouse effect. To the extent that the greenhouse effect is correlated with Earth's temperature history, the cause must link from the Sun to the greenhouse gases. The alternative is the silly proposition that solar radiation variations might be caused by changes in greenhouse gas concentrations.

F. AGW POST-MORTEM.

AGW is dead. Here are some topics for the post-mortem. Forensic analysis of proxy reductions for correlations caused by data set sharing, and subjective smoothing into the instrument record. Forensic analysis of whether proxy temperature reductions have any validity. An à priori model for the tapped delay line representation of climate based on ocean currents. An à priori model for cloudiness as it responds to short wave radiation.

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BIBLIOGRAPHY

Battle, M., M.L. Bender, P.P. Tans, J.W.C. White, J.T. Ellis, T. Conway, & R.J. Francey, *Global Carbon Sinks and Their Variability Inferred from Atmospheric O2 and δ13C*, Science, v. 287, pp. 2467-2470, 3/31/00.

Bender, M., et al., *Gases in ice cores*, Proc. Natl. Acad. Sci. USA, v. 94, pp. 8843-8349, August 1997 (11/15/1995)

Brohan, P., J.J. Kennedy, I. Harris, S.F.B. Tett & P.D. Jones, *Uncertainty estimates in regional and global observed temperature changes: a new dataset from 1850"*, 12/19/05

Kabella, E, & N. Scafetta, *Solar Effect and Climate Change,* letter, Bull. AMS, 1/08, pp. 34-35.

Keeling, C.D., et al., *Exchanges of Atmospheric CO2 and 13 CO2 with the Terrestrial Biosphere and Oceans from 1978 to 2000. I. Global Aspects*, SIO Ref. No. 01-06

Kiehl, J.T. & K.E. Trenberth, Earth's Annual Global Mean Energy Budget, Bull. Am.Meteor.Soc., v. 78, no. 2, 2/1/97, pp. 197-208.

Kohler, P., J. Schmitt, & H. Fischer, *On the application and interpretation of Keeling plots in paleo climate research – deciphering $\delta^{13}C$ of atmospheric CO2 measured in ice cores*, Biogeosciences Discuss., 3, 513–573, 6/14/06.

Lean, J., J. Beer, & R. Bradley, *Reconstruction of solar irradiance since 1610: Implications for climate change,* Geophys.Res. Lett., v. 22, No. 23, 11/1/95, 3195-3198.

Lean, J., *Evolution of the Sun's Spectral Irradiance Since the Maunder Minimum*, Geophys.Res.Lett., v. 27, No. 16, 2425-2428, 8/15/00.

Scafetta, N., & B. J. West, *Estimated solar contribution to the global surface warming using the ACRIM TSI satellite composite,* Geophys.Res.Lett., 32, L18713, 9/25/05.

Scafetta, N., & B. J. West, *Reply to comment by J. L. Lean on "Estimated solar contribution to the global surface warming using the ACRIM TSI satellite composite"*, Geophys.Res.Lett., 33, L15702, 8/1/06.

Scafetta, N., & B. J. West, *Phenomenological solar signature in 400 years of reconstructed Northern Hemisphere temperature record,* Geophys.Res.Lett., 33, L17718, 9/15/06.

Scafetta, N., & B. J. West, *Phenomenological reconstructions of the solar signature in the Northern Hemisphere surface temperature records since 1600*, J.Geophys.Res., 112, D24S03, 11/3/07.

Scafetta, N. (2008), *Comment on "Heat capacity, time constant, and sensitivity of Earth's climate system"* by S. E. Schwartz, J.Geophys.Res., 113, D15104, 8/2/08.

Scafetta, N., & R. C. Willson, *ACRIM-gap and TSI trend issue resolved using a surface magnetic flux TSI proxy model,* Geophys.Res.Lett., 36, L05701, 3/3/09.

Scafetta, N. & B. J. West, *Is climate sensitive to solar variability?*, Physics Today, 3/08, pp. 50-51.

Scafetta, N. & B. J. West, *Interpretations of climate-change data,* Physics Today, 11/09, pp. 8, 10, responses pp. 10-12 by B. R. Jordan; P. Duffy, B. Santer, & T. Wigley; and B. A. Tinsley.

Tans, P.P., et al., *Oceanic 13C/12C Observations: A New Window on Ocean CO2 Uptake*, Glob.Biogeochem.Cycles, vol. 7, no. 2, pp 353-368, 6/93.

Wang, Y.-M., J. L. Lean, & N.R. Shelley, Jr., *Modeling the Sun's Magnetic Field and Irradiance Since 1713,* Astrophys.J. 625:522-538. 5/20/05.

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