

CLIMATE CHANGE – A DEEPER LOOK AT THE EVIDENCE

I have based the following 'REVIEW' strongly on information from the latest NIPCC Report ¹ 2008 (Non-Governmental International Panel on Climate Change) which counters the latest IPCC 2007 report (Intergovernmental Panel on Climate Change); a book written by Singer and Avery ²; and a book written by Svensmark and Calder ³. Other research papers and web documents have also been consulted, although both references 2 and 3 have many hundreds of technical research-paper references. The government pays for the IPCC activities and the research scientists supporting it. IPCC was set up originally "as a political rather than a scientific entity", and this is where the problems associated with so-called 'Global Warming' begin.

1. S F Singer Editor: "Nature, not human activity, rules the climate", NIPCC (Non-Governmental International Panel on Climate Change), Heartland Institute, Chicago April 2008. [This reviews the latest IPCC-AR4 2007 Report and is based on an International Climate Workshop in Vienna in 2007].
2. Singer S F, Avery D: "Unstoppable Global Warming: every 1,500 years", Rowman and Littlefield Inc. Publishers 2007. (A New York Best Seller)
3. Svensmark H, Calder, N: "The Chilling Stars – A new theory of climate change", Icon Books 2007.

BACKGROUND: The first IPCC Summary report in 1990 ignored satellite data as no warming trend was measurable. Unfortunately the next 1995 IPCC report 'doctored' the final text (already approved in the draft by scientists) to emphasise *man-made* influences on climate change. Certain scientists involved threatened court action and they managed to get their names withdrawn from the IPCC Report. Then the 2001 IPCC report claimed unusual warming based theoretically on the sudden 'model-determined' temperature rise (so-called 'hockey-stick' effect), but this has now been shown to be *totally wrong* (fundamental errors in the statistical analysis). The latest IPCC 2007 report now *omits* the 'hockey-stick' graph, but continues with emphasis on man-made (anthropogenic), greenhouse gas influences *without* full regard to the powerful influences of solar activity. Their early reports had few references and only their latest report has indexes and references. To get credibility, "some leading IPCC promoters surround themselves with as many as two dozen authors when publishing research papers". There is a lot of concern worldwide by scientists concerning the lack of total transparency in reviewing all the actual, real data and evidence available. The NIPCC ¹ has set out to address this, and the IPCC should respond with evidence to disprove these counterclaims if they can.

Some interesting general observations:

- Ice-core data show that ice-ages have been the dominant feature down the centuries interspersed with relatively brief, warm periods, but nowhere has the increase in atmospheric CO₂ concentration preceded a temperature change. The CO₂ concentration always has trailed temperature changes by as much as 400-800 years.
- Carbon dioxide gas is a minor greenhouse gas: far less than water and clouds. If the concentration of CO₂ doubles in the atmosphere, then the temperature would increase only by 1^oC at the most.
- Carbon dioxide gas is absorbed by water, clouds, and rain, and its solubility increases as water temperature decreases.

CARBON DIOXIDE CO₂:

CO₂ is not a pollutant, but a vital chemical for the life of plants and vegetables; and therefore mankind. The concentration of CO₂ in the atmosphere varies with latitude. It is highest in the northern hemisphere. The southern hemisphere oceans exhibit a greater rate of CO₂ uptake, but this uptake has slowed over the last few decades due to the general increase in ocean wind activity. Atmospheric CO₂ also varies seasonally. If oceans warm CO₂ levels in the atmosphere increase. But how much is man-generated? What about other non-industrial greenhouse gases like methane CH₄ and nitrous oxide N₂O? The following Figure (Fig. 21¹) shows that CO₂ has increased overall by just a small amount of 15ppm (parts-per-million) in less than a decade, but records show that CO₂ levels have been much, much higher in past centuries. If this is true, and it is provable, why the alarm now when there was no calamity before when the CO₂ levels were even higher? Although CO₂ dissolves to form weak carbonic acid in water and should lower the pH below *neutral* 7, the pH values of the sea range from 8.2 (Norwegian Sea) to 7.9 (Eastern Pacific and Arabian Seas), showing the seas are still weakly alkaline

and not acidic from CO₂. Thus CO₂ could not affect coral reefs and hence, CO₂ levels are not a problem here!

Global Distribution of Atmospheric Carbon Dioxide
NOAA ESRL GMD Carbon Cycle

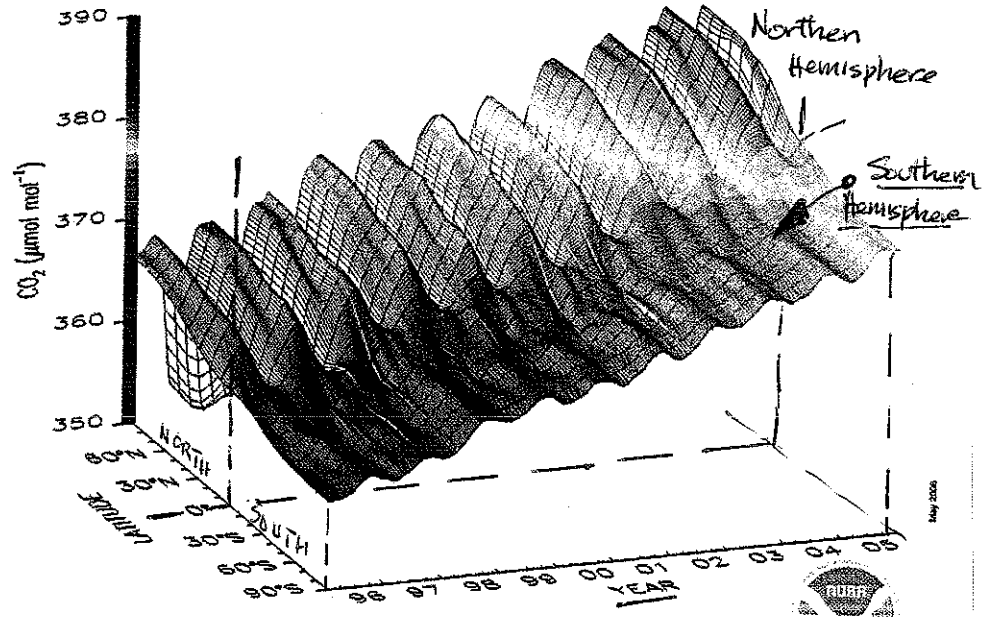


Figure 21: CO₂ levels versus latitude and time [http://www.cmdl.noaa.gov/ccgg]. The level of atmospheric CO₂ is color-coded to the ordinate scale. Data come from the marine boundary layer. Note the latitude variation, indicating a CO₂ source in the Northern Hemisphere. Note the increase in the amplitude of the seasonal variation, suggesting an increase in terrestrial biomass.

The rate of increase in global emissions of CO₂ has lessened from 1975 to 2000 to 1.2 % per year after an annual increase of 4.3% in the 1945-1975 period. Surprisingly, CO₂ levels were growing at a higher rate of 4.4% per year from 1815-1915, before dropping to a growth rate of 1.3% per year from 1915 to 1945 [see Figure: (Fig. 22¹)].

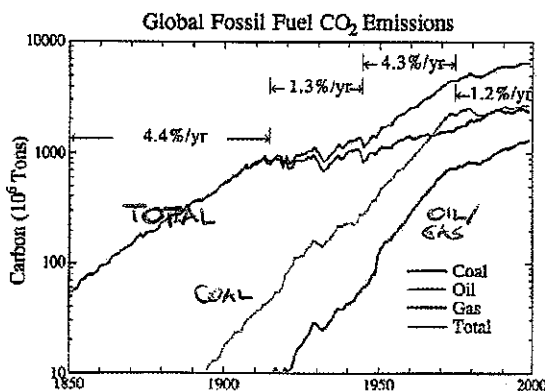


Figure 22: Growth of CO₂ emissions (in megatons per year of carbon) from fossil fuels [Marland 2007]. The top curve gives the total values and growth rates as shown. Note the rapid rise of oil use and then natural gas. Note also that the vertical scale is logarithmic; an exponential rise in emission therefore will appear to be 'linear.'

Yearly CO2 Emission vs Yearly CO2 Increase

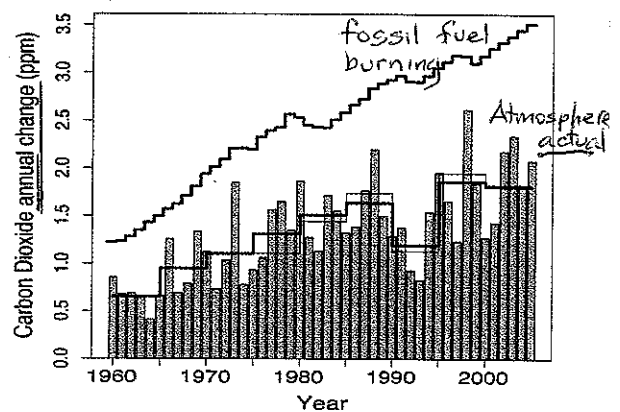


Figure 23: The year-to-year increase of CO₂ vs. time. The bar graph shows an increase in the atmospheric levels, an irregular pattern that correlates well with El Niño warming events and volcanic cooling events. Yet the release of CO₂ from fossil-fuel burning (upper curve) increases smoothly [IPCC 2007, p. 516]. Presumably, there are strong temperature-dependent variations in the CO₂ absorption of the ocean.

Estimates of the variations in the *human* emissions of CO₂ are shown in following Figure (Fig.23¹), but evidence seems to suggest that the fraction of *retained* emissions in the atmosphere is more closely linked to ocean temperatures, El Nino warmings and coolings, and volcanic eruptions. The observed seasonal changes of CO₂ concentrations suggest that the effects of CO₂ transfer are far more complex, as a warmer and wetter biosphere can uptake more CO₂ over and above transfers from decaying biomass, outgassing from permafrost soils, and transfer from ocean deeps to ocean surfaces, to name a few. The solubility of CO₂ decreases about 4% per degree °C rise in water temperature, but most of the changes are near the ocean surface, and with the upwelling of water in warmer areas to the ocean surface. The Figure shows that less than 50% of fossil fuel-produced CO₂ remains in the atmosphere as the rest is absorbed in the oceans and biosphere. The IPCC 2007 report states that *models* have been used to predict the anthropogenic increase in CO₂, but although they indicate that there is 'uncertainty in prediction', they grossly exaggerate the long-term increase in CO₂ emissions from poor countries based on their supposed rate of population growth and subsequent increases in CO₂ outputs. For example, IPCC predict a 70 to 1 increase in real incomes for Asia, whereas as Japan developed, it only ever grew by a factor of 20 to 1. Therefore the prediction of increasing CO₂ is vastly overestimated.

The actual climate data from on-ground weather stations for 50 USA states dating back to 1884 is shown in the following Figure (Fig. 25¹). The bars in the graph show more than 20 States had extremely high (*record*) temperatures in 1934, 1939 and 1951. The next highest number for records was in 1998 with high temperature records for 19 states. Later data show no States with *record highs* in 2001, and in 2003 to 2005. There are no data to indicate that extreme highs are on the increase! The graphical line (10-year moving averages) on the figure shows the highest temperature records were around 1938 and then 1955. 1998 was the third peak, but is in-keeping with the records for two previous levels in 1915-18 and 1988. Clearly the 1930's was the warmest decade in the 20th century.

Record High Temperatures – U.S.

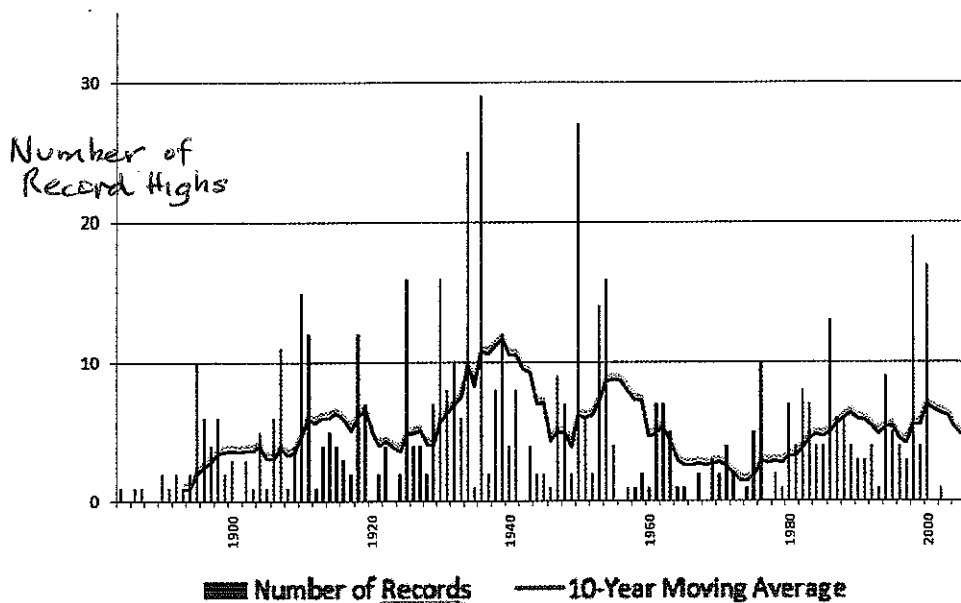


Figure 25: Extreme high-temperature values recorded, by state, in the United States since 1880 [Hart 2007]. Note the peaking around 1940 but not during recent decades; it suggests that the 1930s – not the 1990s – were the warmest decade of the twentieth century.

In actual fact there are clear advantages of increasing CO₂ in the atmosphere. Increasing atmospheric CO₂ increases plant growth rates and is beneficial to plant life. Research has shown that CO₂ levels in the past have been many times higher than the present and produced larger quantities of fauna and flora. Increasing CO₂ levels increase branch and leaf growth, as well as root systems. Laboratory

studies have shown that increasing CO₂ levels by 300ppm increases plant productivity by about 1/3. An enhancement of 48% was reported for 176 trees and woody plants. Apparently higher CO₂ levels produce fewer leaf stomatal pores per unit leaf area, and the pores are smaller thereby reducing water transpiration rates and giving greater plant robustness for drought conditions. Reports have shown that increasing CO₂ enables plants to cope better with higher soil salinity, higher air temperatures, lower levels of soil fertility, insect and animal grazing, and other negative effects.

Increasing levels of CO₂ also has been shown to improve calcification rates of coral. Growth rates also increase with water temperature increase (1°C increases the calcification by 0.39 grams per square centimetre per year). Coral has survived over countless centuries with all the previous changes even when the CO₂ levels were higher, and pH levels show the sea is not acidic even with more CO₂ dissolved. The oceans hold more than 70 times as much CO₂ as the atmosphere. Phytoplankton absorb large amounts of CO₂ from the air but as most oceans are short of iron. Phytoplankton growth rates increased markedly when prairie dust, for example, has been blown into the sea.

The IPCC 2007 authors claim that “most of the observed increase in global temperatures since the mid-20th century *is very likely* due to the observed increase in anthropogenic greenhouse gas concentrations”. They even state ‘better than 90% probability’, but they do not prove that analytically. The Mann ‘hockey-stick’ analysis graph (see the Figure, Fig. 1¹) has been dropped in their latest report (an admission of their error) as it is clearly recognised to be in error and that it ‘washed out’ the “Mediaeval Warm Period” (which was even warmer than the recent years) as well as “The Little Ice Age”. The Greenland Borehole data as shown in the next Figure (Fig. 2¹), other radioactive isotope data of marine organisms (Fig. 3a), data *excluding* tree growth rings (Fig.3b), as well as historical data (see later), all validate these historical warming and cooling periods.

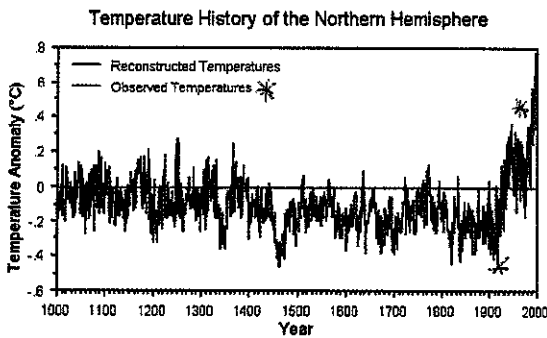


Figure 1: The ‘hockey stick’ temperature graph was used by the IPCC to argue that the twentieth century was unusually warm [IPCC-TAR 2001, p.3]. ‘Reconstructed temperatures’ are derived from an analysis of various proxy data, mainly tree rings; surprisingly, they do not show the Medieval Climate Optimum and the Little Ice Age, both well-known from historic records. The ‘observed temperatures’ (in red) are a version of the thermometer-based temperature record since the end of the nineteenth century.

RANDOM NUMBERS IN THIS COMPUTER PROGRAM GAVE A ‘HOCKEY STICK’ RESULT TOO!!

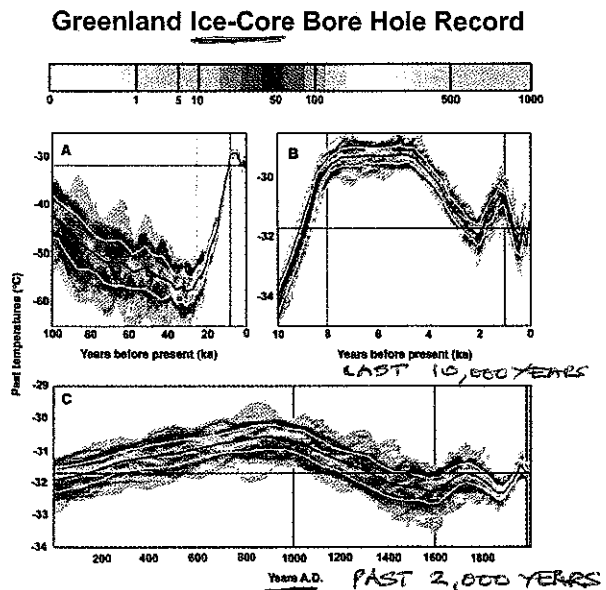


Figure 2: Temperature values from the GRIP ice-core borehole in Greenland. The top left graph shows the past 100,000 years; the dramatic warming ending the most recent glaciation is clearly visible. The top right graph shows the past 10,000 years (the interglacial Holocene); one sees the Holocene Climate Optimum, a pronounced Medieval Warm Period and Little Ice Age, but an absence of post-1940 warming [Dahl-Jensen et al. 1999]. The bottom graph shows the past 2,000 years in greater detail.

The climate cooled from 1940 to 1975 while CO₂ was rising quickly. Global satellite data since 2001 show no warming trend even though CO₂ is still rising. The UK Met Office predicts that further warming is unlikely before 2009. Hence, increasing CO₂ either from man-made or natural causes cannot be

strongly linked to warming at all. Unfortunately IPCC and many other pro-global warming pundits *rely on computer models* which use a lot of 'adjustable parameters' to improve curve-fitting, rather than rely on satellite and ocean buoy temperature measurements. The IPCC does not give high regard to cloud types, cloud size, cloud array or spacing, and cloud height, and water and ice particles in the atmosphere. Clouds are 30 to 60 times more significant than CO₂ as greenhouse 'gases'. IPCC undervalue the very significant forcings from solar activity which includes 'solar wind radiation and ionised particles, and magnetic effects.

Prehistoric Temperatures from Proxy Data

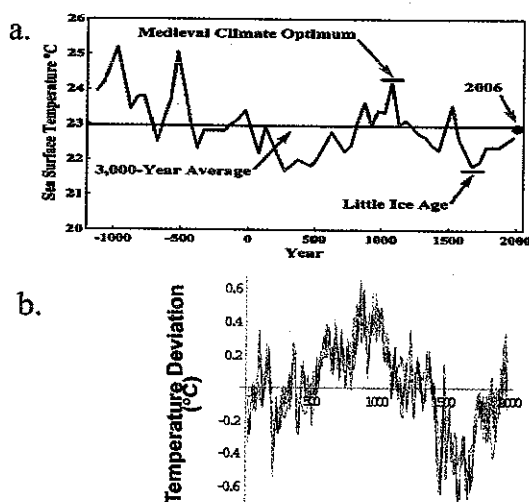


Figure 3a: Surface temperatures in the Sargasso Sea (a two million square-mile region of the Atlantic Ocean) with time resolution of 50 to 100 years and ending in 1975, as determined by isotope ratios of marine organism remains in deep-sea sediments [Keigwin 1996]. The horizontal line is the average temperature for this 3,000-year period. The Little Ice Age and the Medieval Climate Optimum were naturally occurring, extended intervals of climate departures from the mean. A value of 0.25 degrees C, which is the change in Sargasso Sea temperature between 1975 and 2006, has been added to the 1975 data in order to provide a 2006 temperature value [Robinson et al. 2007].

Figure 3b: Paleo-temperatures from proxy data (with tree rings eliminated). Note the Medieval Warm Period is much warmer than the twentieth century [Loehle 2007]. A slightly corrected version is given by Loehle and McCulloch [2008].

The USA National Academy of Scientists in 2000 found that the temperature trends of both the earth's surface and the troposphere (first 15km above the equator; 8km above the poles) could not be reconciled. The US Climate Change Science Program in 2006 expanded the programme and reported temperature data from satellites and weather balloons to show *no* increase in warming (even a slight cooling with altitude in the tropical zone). This is *opposite* to the greenhouse-gas, *theoretical models* which showed an increasing warming trend with elevation which peaked about 10km at approximately twice the temperature [See the following Figures (Figs. 7 and 8)¹]. Hence, the measured warming is occurring principally on the surface and not in the atmosphere, and cannot therefore be attributed to any CO₂ greenhouse effect.

The *differences* between actual data and the values *predicted* by the models is more clearly seen in the next Figure (Fig. 10¹). Clearly the observed or *real measured* values are lower than the model-predicted values over the elevation range to 15km.

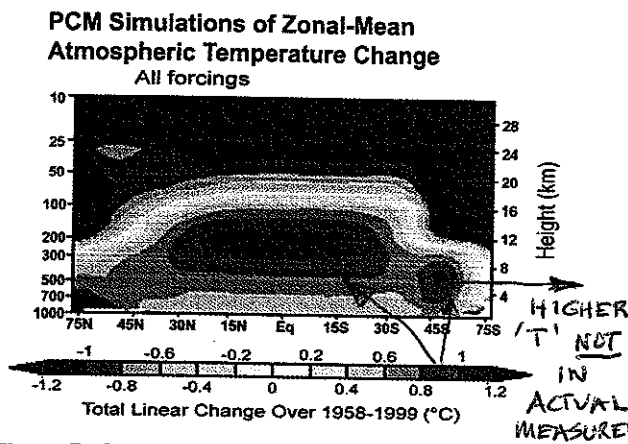


Figure 7: Greenhouse-model-predicted temperature trends versus latitude and altitude; this is figure 1.3F from CCSP 2006, p. 25, and also appears in Figure 6 of the current report. Note the increased temperature trends in the tropical mid-troposphere, in agreement also with the IPCC result [IPCC-AR4 2007, p. 675].

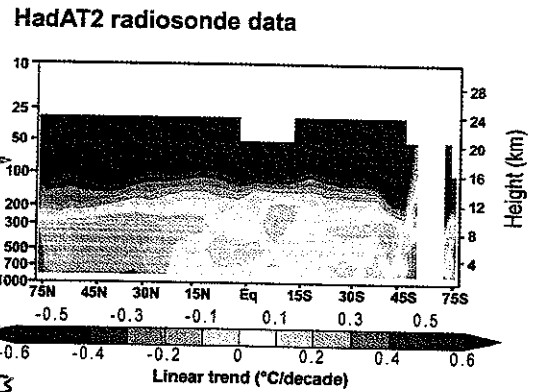


Figure 8: By contrast, observed temperature trends versus latitude and altitude; this is figure 5.7E from CCSP 2006, p. 116. These trends are based on the analysis of radiosonde data by the Hadley Centre and are in good agreement with the corresponding US analyses. Notice the absence of increased temperature trends in the tropical mid-troposphere.

Models and Observations Disagree [Douglass, Christy, Pearson, Singer 2007]

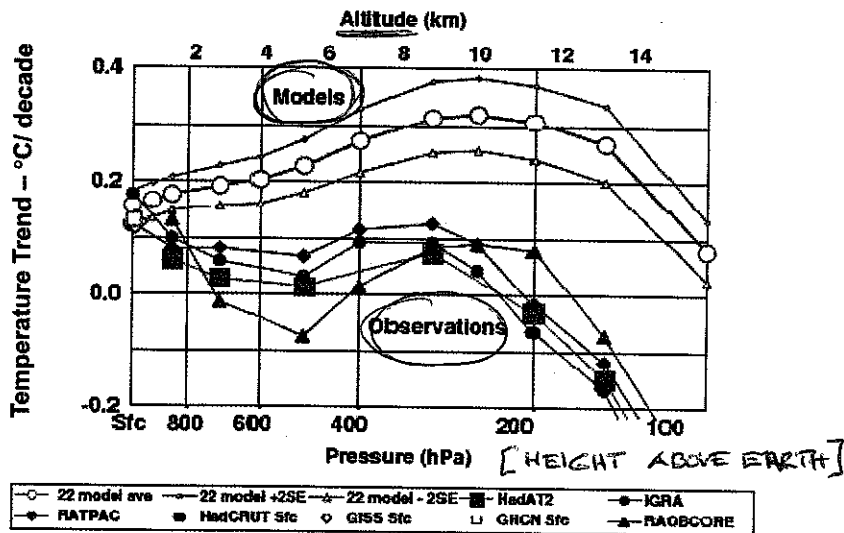
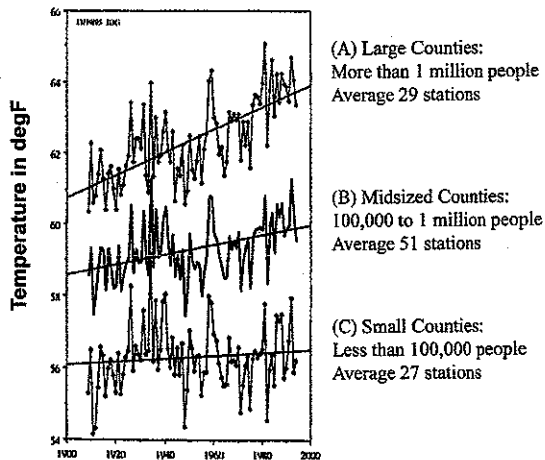


Figure 10: A more detailed view of the disparity of temperature trends is given in this plot of trends (in degrees C/decade) versus altitude in the tropics [Douglass et al. 2007]. Models show an increase in the warming trend with altitude, but balloon and satellite observations do not.

Models require a basis from which to develop realistic analysis to give realistic trends. If the surface temperature data are wrong then the models will be wrong. Weather stations around the world have been recording data for over 100 years, but the station numbers are small (and decreasing) and their location questionable. At locations where populations have increased markedly over a century the 'increases' have been stronger for big cities than for rural areas, showing interference from buildings, roads, and other local population density factors. This is seen in the following Figure (Fig. 11¹). The number of weather stations has decreased markedly since 1970 and the data patterns now are less reliable.

The following Figure (Fig. 13¹) shows lower troposphere temperature satellite data from 1979 to 2007. In essence there is no trend prior to 1997. 1998 was indeed a worldwide warmer year. There is no real trend from 2001. The sudden upsurge in 1998 has been attributed to the El Nino effect. It clearly cannot be due to anthropogenic influence as it was too sudden and non-lasting. Also the pre-1940 warming could not be attributed to man-made effects or greenhouse gases, but must have been from

natural causes and solar flux changes. Clearly as there is no sustained and gradual warming now when compared with the clear warming from say 1890 to 1935 (see Fig.25 again), the argument for man-made CO₂ effects cannot be justified from the scientific evidence.



Urban Heat Island Effect

Temperature Trends at 107 Californian Stations 1909 to 1994
Stratified by 1990 population of the county where station is located

Figure 11: A demonstration of the 'urban heat island' effect: Observed (surface) temperature trends from California weather stations are shown to depend on population density: (A) Counties with more than 1 million people, (B) 100k to 1 million, (C) less than 100k people, respectively [Goodridge 1996]. But note that all three [High, Medium, and Low density] show a temperature rise up to 1940, followed by a pronounced cooling.

Global Lower Tropospheric Temperature, 1978-2007

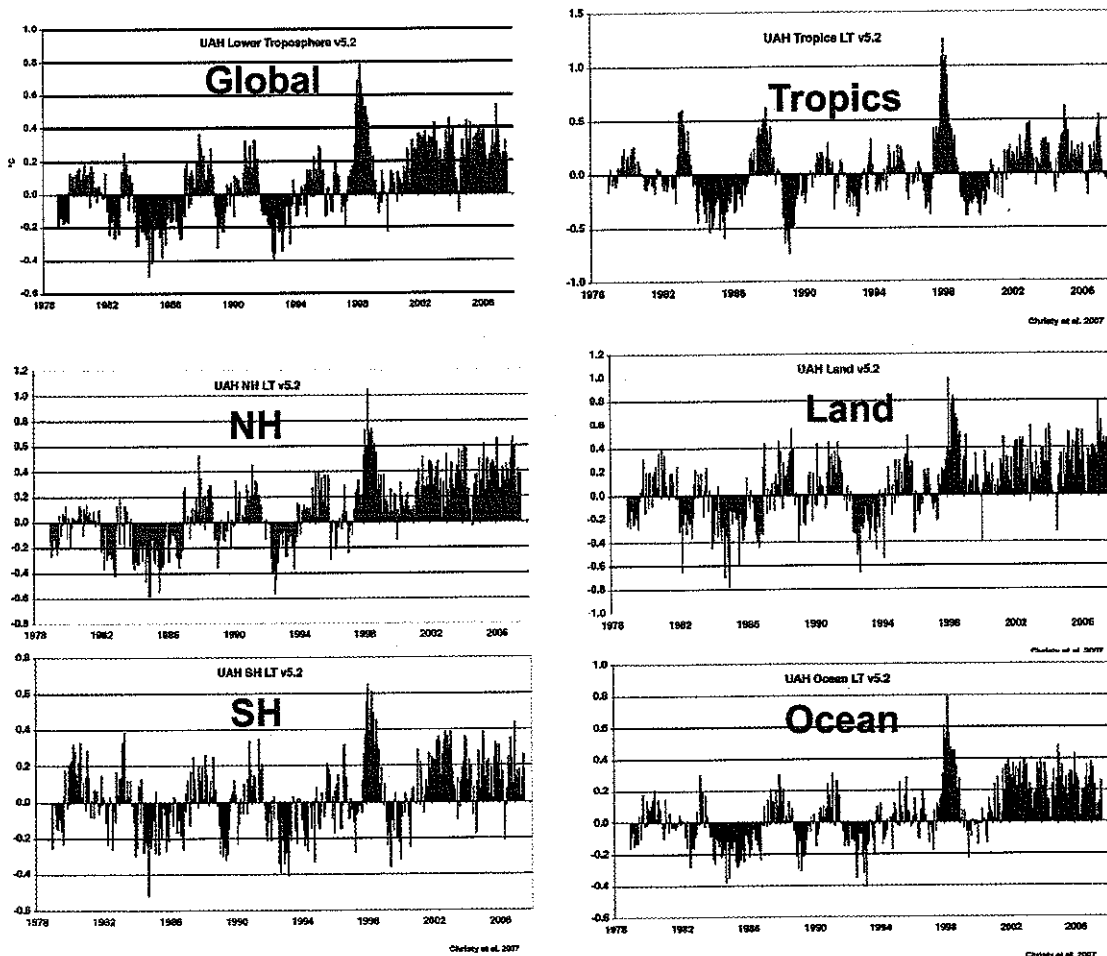


Figure 13: Lower troposphere temperatures versus time from MSU-UAH satellite data. (a) Global; (b) Northern Hemisphere; (c) Southern Hemisphere; (d) Tropics [20 N-20S]; (e) Land; and (f) Ocean [Christy et al. 2007]. Note the absence of a significant trend before 1997 and after 1998. Evidently, the calculated linear trend values (in degrees C per decade) depend on the choice of time interval.

The IPCC reports omit or downplay the very important established findings of the effects of solar ultraviolet energy, solar wind and its magnetic affect on cosmic rays, as well as cloud coverage. An interesting result is based on carbon-14 variations over 3,000 years in a stalagmite from a cave in Oman. These isotope variations correspond to changes in cosmic ray levels from outer space that are modulated by solar activity. The oxygen-18 isotope values are closely linked and are a proxy for solar activity ['solar wind' (charged ions) and magnetic activity]. The evidence is given in the following Figure (Fig. 14¹), and a central 400 year period is amplified in the lower figure for the isotopes produced by cosmic rays variations. The correspondence is quite remarkable.

An investigation of calcium and magnesium isotopes in fossilised-sea shells have shown that CO₂ has been as much as 10 to 18 times higher than it is today (Shaviv and Veizer)². Satellite² and high-altitude balloon data confirm that temperatures in the lower atmosphere are warming more slowly than the variable Earth's surface temperatures. This would indicate that CO₂ is not the primary factor. History has shown that CO₂ levels lag behind temperature increases by as much as 400-800 years. A French Atomic Energy Commission scientist used Argon isotopes to also validate this delay period, and concluded that CO₂ was not forcing climatic change. As CO₂ levels go up, trees and plants absorb more, roots and trunks grow bigger, and more soil carbon is sequestered under grassland and other plants.

Solar Activity and Climate (as seen by proxies)

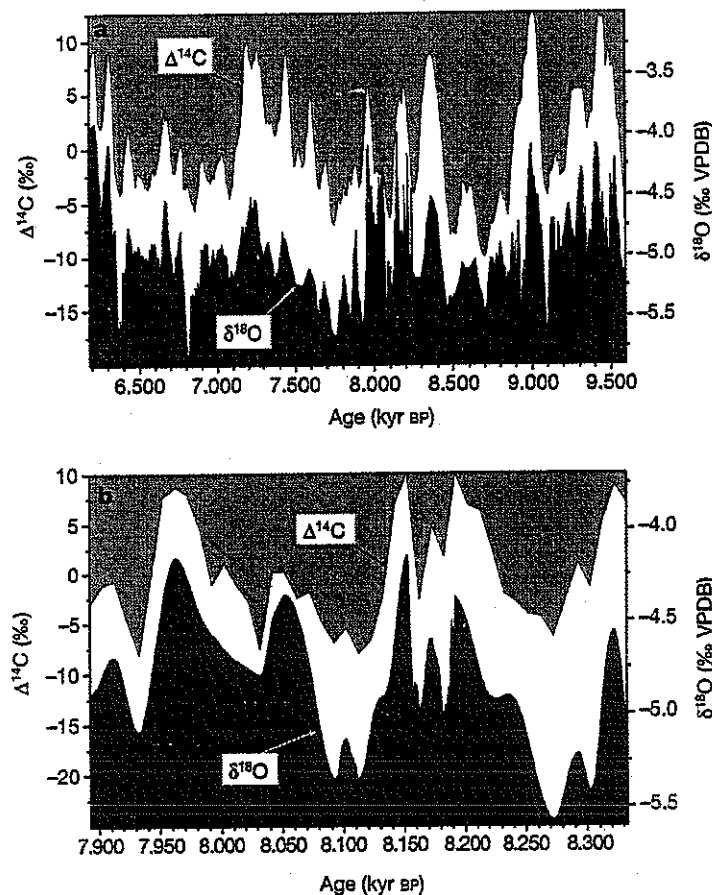


Figure 14: Values of carbon-14 (produced by cosmic rays – hence a proxy for solar activity) correlate extremely well with oxygen-18 (climate proxy); data are from a stalagmite in Oman [Neff 2001]. The time interval covers more than 3,000 years, from about 9,600 to 6,200 years before present (BP). The lower graph shows a particularly well-resolved time interval from 8,350 to 7,900 years BP. It would be difficult to explain this detailed correlation except through the modulation of galactic cosmic rays by changes in the solar wind and solar magnetic activity [Singer 1958]. The mechanism whereby cosmic rays influence terrestrial climate is most likely a change in cloudiness, as suggested by Svensmark [2007a, 2007b]. *

If the CO₂ greenhouse theory was valid, the temperatures in the Arctic and Antarctic would have risen several degrees since 1940 from increasing CO₂. Doran² published a paper in *Nature* and stated the Antarctic, meteorological data demonstrates a net-cooling on the Antarctic continent between 1966 and 2000. Twenty one Antarctic surface stations show an average decline of 0.008°C from 1978 to 1998. Infrared satellites show a decline of 0.42°C per decade. The National Oceanographic and Atmospheric Administration confirm this temperature lowering. In the Arctic, the only melting in Greenland is around the edges², not the ice cap, and this is what was observed at the beginning of the Mediaeval Warming period around 985AD. The University of Alaska² obtained data from 125 Arctic land stations and buoys, found warming from 1917 to 1937, but no clear trend since.

SEA LEVEL CONCERNS:

Sea level changes can be caused by many factors: tectonic plate uplift and subsidence, ice-shelf melting, expansion of the ocean masses if ocean temperatures rise, are some of these. Data from 37 tidal-gauge stations since 1900 have shown a sea-level rise of only 1.8mm/year in spite of warming and cooling. Satellite altimetry measurements show virtually no changes over the last two decades. The IPCC report greatly over-estimates sea level rise. The sea level at the Maldives, for example, was predicted to increase and swamp the island, but the sea level there actually fell 20-30cm in the last 30 years. The following Figure (Fig. 18¹) shows the tidal gauge data as varying but only increasing slightly over the last century. Again there is no historical evidence of marked increases in sea level and nothing to support scientific predictions for large sea level increases. If current estimates for large future rises are grandiose and non-justifiable, then the other estimates also become questionable. Simply stated, increased atmospheric CO₂ levels cannot be blamed for this.

Sea Level 1900-1980

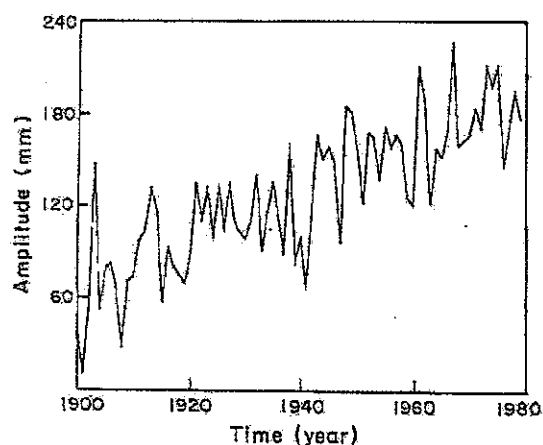


Figure 18: Sea-level (SL) values for 84 tidal-gauge stations with more than 37 years of data [Trupin and Wahr 1990]. They have been corrected for post-glacial rebound. The average rate of rise is ~18 cm per century. Note absence of any acceleration in SL rise during warming intervals. While satellite data [Cazenave and Nerem 2004] suggest a higher rate of rise, an analysis by Holgate [2006] shows a lower rate in recent years.

MODELS IN CONFLICT:

IPCC persist in using models to predict the future rather than use actual measured data and trends from those data. To start with, the computational analytical domain size (basic computer grid elements) is huge; 150km x 150km by 1km high, with the current computer power. Computer modellers cannot account for the average-behaviour of clouds, most of which are much, much smaller than their grid or 'pixel' size. It is no wonder that the computer simulations are so disparate and often in conflict with each other and measured data. Current models do not include the effects of 'global dimming' due to

particulate emissions and the highly significant localised effects of water vapour and water 'dimers' (water molecule *couplets*) and their effect on near-infrared absorption of incoming solar radiation. Predictions from different theoretical models often do not even agree. They use a lot of averaging and computer re-runs to 'home in' on what they *believe* is the best assessment of the outcomes (biased, non-scientific approach). Models are defective in the application of the effects of aerosols, the growth estimates of the effects of methane, ozone depletion, and effects such as the spatial distribution of clouds vertically, horizontally, and with changing latitude. The greenhouse models do not explain many factors such as the cooling trend in the larger part of the Antarctic, El Nino differences and many of the other cyclical changes, severe changes like the Asian summer Monsoon precipitation, and local and/or regional precipitation effects. Two models were used to predict the future changes of climate for 18 regions in the USA [see the next Figure (Fig. 16¹)]. The details are in the caption. In about *half* the regions, the two models predicted the opposite results! Models may be useful for projecting possible consequences, but they cannot depict or predict an open-ended, chaotic climate system. Fortunately models can be tested like this and there is a long way to go before they can be trusted!

Percent Change in Predicted Rainfall - 1990 to 2090 - Two Climate Models

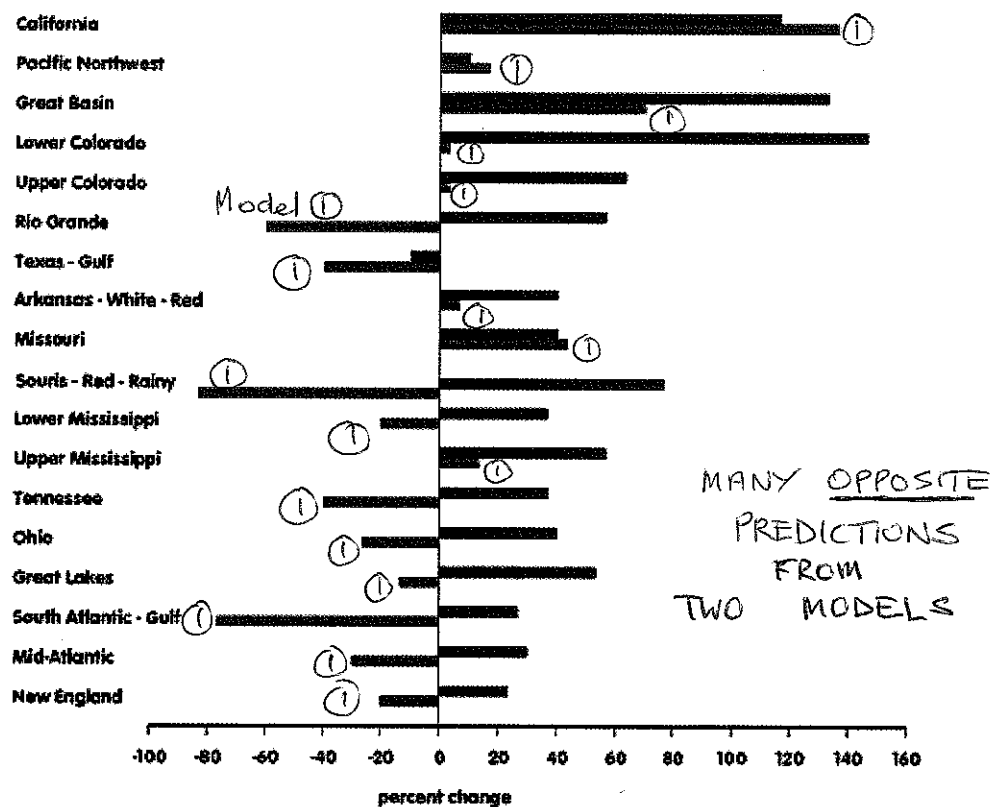


Figure 16: A result from the U.S. National Assessment of Climate Change [NACC 2000]: Expected precipitation for 18 regions of the United States, according to the Hadley model and Canadian model. Note the huge differences between the two model results in magnitude and even in sign. For example, the Dakotas (Souris - Red - Rainy) can turn either into a swamp or into a desert, depending on which climate model is used.

CLOUDS:

Clouds scatter about one half of the incident sun's energy back into space and hence have a significant cooling affect on earth. When we fly over the oceans and above the clouds, we observe just how bright and extensive is the cloud cover. But cloudy nights are often less chilly than starry nights due to their 'greenhouse effect' preventing much heat escaping in that local area from the earth's surface. Although clouds radiate infrared energy into space, the tops of the clouds are often much colder than the ground temperature and so the heat loss is less. The three NASA satellites launched in 1984 and 1986 measured the incoming sunlight and the outgoing infrared energy around the world (NASA's Earth

Radiation Budget Experiments). They showed that the effects were quite complex overall with clouds by-and-large acting as strong coolers. The thick clouds at middle altitudes are the most efficient coolers and occupy about 7% of the world's surface at any one time. The low clouds cover about 4 times as much surface area and account for about 60% of the total cooling. By contrast, the thin, feathery, cold, Cirrus clouds (around -40C) give an overall warming affect. Among the low-level clouds the stratocumulus blankets about 20% of the earth's surface, bar the sunshine, while radiating heat back into space as their cloud tops are warm. Overall, clouds reduce the incoming sunshine by about 8% and a small *increase* in cloud quantity would greatly cool the earth. Thus clouds play an enormous role in climate change. Conversely if clouds did not exist, the earth's surface temperature would rise by an estimated amount of 10C⁰.

Cloud cover varies over the year. Astronauts in space have commented that at certain spacecraft positions, the 'earth' shines more brightly showing it is rejecting more of the Sun's light as well as the warming rays. Of course on earth we can sometimes see the moon brighter from the reflection from the clouds on earth. Nowadays satellite pictures on TV are now very common and are used worldwide in weather, storm and hurricane reporting. The variations in cloud distributions, cloud turbulence and patterns like those at the roaring forties, and larger effects like the El Nino events, have given greater insights into the dominant effects of clouds on the world climate scene. "They have also revealed a connection between and cloudiness and the rhythms of the sun"³.

Svensmark³ used average monthly cloud records over the oceans taken from geostationary satellites high over the equator and compared the results from cosmic-ray data from various sources from the monthly neutron counts at Climax Colorado and found a striking match. Between 1984 and 1987 the sun gradually became 'less stormy' (less charged particles emitted) and more cosmic rays reached earth and ionised (electrically charged) gas molecules. Cosmic rays increased 1.2% annually in that period. In that period cloud cover increased by nearly 3%. Cosmic rays then declined over the following 3 year period from 1988, and cloudiness decreased 4% showing a correlation between cosmic ray increase with decreasing sun activity, and the quantity of cloud cover.

Cosmic rays from outer space must break through the defensive shields of the sun's magnetic flux, the earth's magnetism, and the surrounding layer of air on earth. Only the most energetic charged particles can travel to the earth's surface. They are termed 'muons' or 'heavy electrons' produced when incoming cosmic rays hit the atmosphere. Svensmark³ postulated that only the most energetic cosmic rays could reach closest to the earth's surface and these muons helped form clouds at the lower altitudes. Conversely clouds are fewer when cosmic rays are lower. The sun therefore is the potent force for climate change with the added influence of cosmic rays both from our sun and exploding stars from the greater solar system. The exploded stars (supernovas) eject charged particles called cosmic rays; 'atomic bullets', that rain down on the earth from the Milky Way. Unfortunately IPCC rejected the postulate and Svensmark was verbally attacked by many climate scientists. Fortunately a few prominent researchers saw the connection, and this eventually led to them to show the strong connection of solar variability with low cloud formation (below 3km), which already had been determined to be responsible for 60% of the cloud cooling on earth. When there are more cosmic rays, the tops of the low clouds were measured as warmer, and thus radiate more heat back into outer space, thereby increasing their cooling effect. Satellites over the oceans have revealed that at least 2/3 of those clouds have smaller water droplets condensed on smaller 'specks' making them more transparent to heat energy radiating back from the earth's surface (like clouds appearing behind ships as they exhaust many small specks into the air). It was proposed that the tops of low clouds could be stimulated by the incidence of cosmic rays all over the world. The average cosmic ray intensities have declined over the last 100 years which implies a reduction in cloud cover and some increased warming on earth. A startling experiment at the Danish National Space Centre in 2007 using a chamber of air showed that cosmic rays released electrons which augmented molecular aggregation and thus the formation of small specks or seeds for droplet condensation to form and thus cloud formation in the chamber. In essence cloud simulation had been achieved by cosmic rays in a laboratory-scale experiment! Clouds are 'in charge' of climate.

NASA's satellites (Earth Radiation Budget Experiments) showed that clouds exert a warming effect in Antarctica while over the rest of the world cloud-cooling effects are overall dominant. The Antarctic is unique in that its climate is effectively 'separated' from the rest of the world by intense westerly winds in the southern ocean, a large sea current, and a vortex in the stratosphere travelling at about 800km/day. This is more effective than its North Pole counterpart, and the southern climate and hence the southern region has some special characteristics.

In 2006 the French-IUS Calipso and NASA's CloudSat satellites began a 3-year programme using laser beams and millimetre radar. They could discern layers within thick clouds and measure droplet sizes in clouds as well as in rain. Moisture in the atmosphere plays a big part in the radiation of infrared energy (heat) from the earth at night. Deserts and dry areas with little atmospheric moisture become very cold at night whereas in the tropics the water molecules intercept and radiate it back to earth (natural greenhouse effect), making warm, balmy evenings.

The earth has warmed about 0.6°C during the 20th century, but $\frac{1}{2}$ that occurred before 1945 when the sun was more active and cosmic rays were diminishing. The sun's magnetic activity decreased in the 60's and early 70's, resulting in an increase in cosmic rays and thus pronounced cooling. The slight warming resumed after 1975 when the sun's activity again increased and cosmic ray incidence decreased. The Rutherford Appleton Laboratory near Oxford England has shown that the strength of the sun's magnetic field has more than doubled in the last century, and that the solar field was equally strong in all directions.

LESSONS FROM HISTORY:

The 'little ice age' which peaked around 300 years ago has given way to the present warm interlude². Sunspots were scarce as the magnetic activity decreased, resulting in more cosmic rays and the consequent nuclear reactions in the air. These lower temperature periods have occurred 9 times over that past 11,500 years, and are always associated with high counts of radiocarbon and other radioactive tracers. In these 'ice age periods', icebergs carrying stones and gravel (rafting) travelled further before they melted and dropped them as they moved toward the equator. This coincided with the low solar activity.

Ice ages have apparently dominated 90% of the earth's climate over all the ages. At the moment the earth's orbit is not very elliptical, but over very long periods of 100,000 years or so, the earth distance from the sun can vary about 3%, affecting the energy received by earth as much as 20 to 30%. Also the earth also has an axial tilt which varies cyclically over a 41,000 year period. It is currently about 23 degrees and at the middle of the cycle. Hence the sun's energy intensity varies with latitude and season. In addition, the earth slowly wobbles on a 23,000 year cycle as it spins, and this precession also affects the climate especially at the North Pole. When the North Pole is pointed toward the star Vega (one of the brightest and nearest to earth), the earth gets hotter summers and harsher winters. Added to all this is the 1,500-year solar driven cycle that drives most of the climate change. This regular-cycle discovery came from the analysis of two Greenland Ice-Sheet, ice cores drilled 1,000 miles apart to a depth of one mile each. Information was deduced from oxygen isotope 16-18 ratio analysis (Dansgaard and Oeschger 1984). The cycles were confirmed with known glacier advances/retreats, as well as Atlantic Ocean seabed sediment core data. [The C-14 and Beryllium Be-10 isotopes vary inversely with the strength of solar activity]. Ice core data have shown that there has been a regular 1,500 year cycle of severe climate change during 11,000 years since the last Ice Age, and there are ice-core and seabed sediments to verify this from all over the world. Again these changes cannot be attributed to CO₂ effects. The 1,500-year cycle was later confirmed from ice-core samples from the Antarctic by a French/Russian team, and sea surface temperatures in the Sargasso Sea, ice-rafted debris in the southern North Atlantic Ocean, and stalagmite analysis. Again these changes cannot be attributed just to CO₂ effects.

The Romans also experienced a warming from 200BC to 600AD². Grapes were cultivated in Rome for the first time and grapes and olives grew in the further north of Italy than in earlier centuries. Prior to

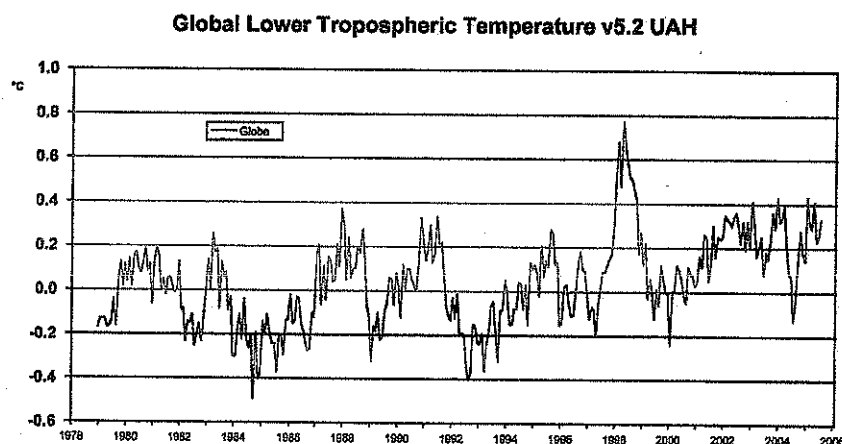
that period (around 500BC) the Tiber River had frozen over, and also European glaciers advanced during the early part of the Roman civilisation. However, after the Roman warm period, Europe's weather changed drastically from about 500 to 900AD where tree growth rings virtually ceased as temperatures dropped. Historians² recorded severe weather changes, with the sun's intensity dropping markedly for a period of over a year with poor crop yields. The Black sea froze in 800AD and ice formed on the Nile in 829AD.

This was followed by the "Medieval Warm Period" that lasted from about 900AD to 1300AD. Cultivation² and tree-line limits were pushed 100 to 200m higher in Europe, and tree-ring records in California showed increases in this warmer period. The Norse colonised Greenland and grew crops and even grapes and pastured cattle on land that had been frozen tundra for over 500 years. Wheat was grown as far north as Trondheim in Norway and oats as far north as the Arctic Circle. Numerous copper mines flourished in the Alps until ice sealed them off in later centuries. Records from the Mediterranean area, South East Asia, North America, and Chinese regions have shown that this warm period was indeed quite extensive, if not world wide².

This "Medieval Warm Period" was again followed by the "Little Ice Age" from 1300AD to 1850AD (1645-1715AD being the coldest period)². This was also quite sudden and there were many wet years all over Europe with vastly reduced harvests. In 1315 the grain failed to ripen all across Europe. Severe storms and bad weather resulted in wide-spread disease, epidemics, malnutrition and the death rate rose rapidly. The Norse colonies became desperate as crops failed, animals starved, the sea ice encroached again, and the Vikings starved and died. This all got worse from the 16th century onward. Ice sheets formed along the English Channel and in 1676 the Thames froze in London. Marginal land in Scotland was abandoned. Food shortages killed millions between 1690 and 1700, but there were more famines in 1725 and 1816. It was truly a devastating cold 'period' and was reported as far as China and Japan.

This "Little Ice Age" was followed by a warming trend from 1850 to 1940AD; then a small cooling trend from 1940 to 1975. From 1976 to 1978 there was a warming spurt followed by a very light warming trend from 1979 to the present (very slight according to satellites and weather balloons, but a little stronger from thermometer data). From 1974 to 2004 the rate of increase was 0.124⁰C per decade [see Figure (Fig.P.3²)].

Figure P.3 Satellite Temperature Record 1979-2004, trending up at a modest 0.125° C per decade. A strong El Niño occurred in 1998.



Compiled by John Christy, University of Alabama-Huntsville

Published research evidence from a wide spectrum of independent scientists is extensive. 120 research papers are summarised in Reference 2, Chapter 4, pages 61-99. Data from tree-ring analyses, ice cores, sediment and sea-bed core, stalagmites, dust plumes, plankton, collapsed cultures, prehistoric villages, fossilised pollen, tooth enamel, bird sediments, glacial movements, algae skeletons, titanium profiles, niobium ions, and much more, are presented. Data are reported from the Arctic and sub-Arctic, Europe, China, Tibet, Africa, Canada, North America, Latin America, South America, New Zealand, South Africa and Antarctica. The far reaching collective data support the existence and the extent of the "Medieval Warm Period" and the "Little Ice Age". These independent analyses cannot be dismissed. These extensive changes in Climate could not have been caused simply by increases or decreases on CO₂.

Sunspot activity has been 'recorded' since the 16th century. From 1640 to 1710 virtually no sunspot activity was observed, and over that 70 year period it was coldest. More recently a linkage has been made between C-14 radioactive isotopes in tree rings, and Beryllium Be-10 isotopes in ice cores in Greenland. Both are produced by cosmic rays striking the upper atmosphere and thus both are linked to solar activity. When the sun is more active it sends out a 'solar wind' of charged particles that protects the earth from some cosmic rays. More cosmic rays impact the outer atmospheric layers and eventually create more cloud nuclei and thus wet clouds that reflect solar energy back outer space. A more active sun also emits more UV producing more ozone O₃ from oxygen O₂ thus increasing temperatures in the atmosphere as they absorb more UV. A 0.1% variation in the sun's radiance has been calculated to cause a 2% change in ozone concentration in the atmosphere².

A NASA and MIT team of researchers recently (2001) discovered a huge climatic heat vent in the earth's atmosphere. Japan's GMS-5 Geostationary satellite was used for cloud cover data and temperature data came from USA's long-range NCEPT planes. Cloud cover data and sea temperatures were analysed for the vast ocean region ranging from Australia, Japan and Hawaii. When the sea surface temperature reaches 28^oC, more moisture in the atmosphere creates low, wet clouds and the rainfall efficiency goes up markedly. High clouds with fewer ice crystal formations decrease, meaning the Cirrus clouds (efficient insulators) decrease with the resultant subsequent cooling. Massive amounts of heat energy are vented to outer space.

Data from NASA ACRIM satellites monitoring the sun's radiation showed that radiation increased 0.05% per decade from 1978 to 2003. This is the real cause of any significant warming. The results as shown in the following Figure demonstrate a very strong correspondence between Arctic-wide surface temperatures and solar total irradiance (top Figure), but NO correspondence between atmospheric carbon dioxide CO₂ and radiant energy arriving on earth (bottom Figure). This is an amazing result, and again shows no scientific evidence that climate change can be directly coupled to CO₂ in general or man-made CO₂ in particular.

SUMMARY

The recent history of climate change [Roman Warming, Dark Age Cooling, Medieval Warming, Little Ice Age, 20th century patterns] and their extensive effects cannot be attributed to increasing CO₂. Most of the warming in the last century occurred *before* 1940. Temperatures declined from 1940 to 1975 even with an upsurge of CO₂ emissions. CO₂ has not caused planetary overheating. Meteorological stations and ocean buoys show that temperatures in the Arctic and Greenland and surrounding seas are colder than in 1930. In the Antarctic, only the Antarctic Peninsula (juts toward Argentina) has been warming, and over 98% of the Antarctic continent (14+ million square kilometres) has been cooling since the 60's (Satellite and surface station data). The short-term temperature spike in 1998 was caused by the strongest El Nino effect in recent centuries, and temperature trends from Satellites show only a 0.125^oC / decade over the last 20 years.

Climate has forever been changing and will continue to do so. The major *driver* is the sun and the radiation from it. The main atmospheric 'intermediary' between the sun and earth is water, and thus it dictates the *behaviour* of the earth's climate. Without water vapour in particular and other greenhouse

gases in the air in general, the surface air temperatures worldwide would be well below freezing. The sun clearly must have a much bigger influence on global temperatures than any of the greenhouse gases, even water and CO₂ (about 1/60 of the water in air). CO₂ is clearly not the major player even though it is wise to minimise man-made emissions as well as particulate emissions, pollutants, obnoxious chemicals and gases where practically possible. Doubling or trebling the amount of carbon dioxide will virtually have little impact, as water vapour and water condensed on 'particles' as clouds dominate the worldwide scene and always will.

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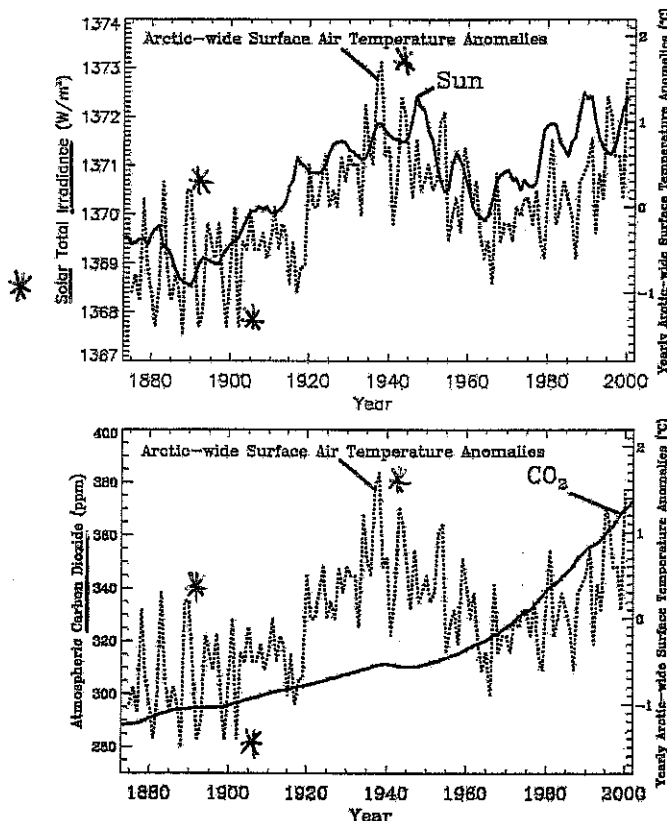
CARBON DIOXIDE CO₂
BEST ESTIMATES OF THE LOCATION of CO₂ as Carbon (C)

	Giga tonnes Gt (BILLION tonnes)
Atmosphere	750 Gt
Oceans – surface	1,000 Gt
Oceans – intermediate / deep	38,000 Gt
Vegetation (soil, detritus)	<u>2,200 Gt</u>
	<u>41,950 Gt</u>

Annual EXCHANGE of CO₂

Ocean surface – Atmosphere	90 Gt
Vegetation – atmosphere	60 Gt
Between Marine biota and Ocean Surface	50 Gt
Oceans(surface-to-deep)	100 Gt
Human emissions (coal, oil, nat. gas)	6 Gt <2%
	<u>306 Gt</u>

Figure 2.1 Arctic Temperatures Correlate with Solar Activity, Not CO₂



CO₂ effects
 are zero or
 minimal!!

Source: W. Soon, "Variable solar irradiance as a plausible agent for multidecadal variations in the Arctic-wide surface air temperature record of the past 130 years," *Geophysical Research Letters* 32, 2005.