

NEWSLETTER

New Concepts In Global Tectonics

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LANCE ENDERSBEE

CLIMATE CHANGE IS NOTHING NEW!

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ARTICLES

CLIMATE CHANGE IS NOTHING NEW!

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Abstract: Since 1750 the electromagnetic radiation of the Sun has increased significantly, as indicated by the sunspot record. This increased electromagnetic radiation is considered by the author and others to be the real cause of global warming. The examination of the annual temperature records of the northern and southern hemispheres shows a sharp change and major increases since 1978, especially in the northern hemisphere. This is the so-called hockey stick effect, which the author concludes is not due to the influence of Man, and probably due to a change in the geothermal regime of heat flow from the fracture zones in the floor of the northern oceans. There is some confirmation of this in recent sea floor explorations. The role of atmospheric carbon dioxide and methane is considered in relation to claims that emissions by Man are causing global warming. It is shown that the increased warming is due to the Sun, and that the consequent warming of the oceans is causing the ex-solution of carbon dioxide and methane from the oceans, simply due to the decreasing solubility of these gases in sea water with increasing ocean temperatures. The extensive exploitation of groundwater around the world over the past century, at rates far in excess of possible recharge, has created a net addition to the hydrosphere commensurate with the apparent rise in sea levels over the past century. There is deadly pollution in the atmosphere over many world cities and industrial regions. These are local and regional matters, and should be corrected at the sources of pollution. Air pollution and global warming are scientifically separate matters.

Keywords: *climate, sunspots, carbon dioxide, methane, geothermal, cosmic rays*

INTRODUCTION

In February 2007 the Intergovernmental Panel on Climate Change (IPCC) issued a report, *Climate Change 2007: The Physical Science Basis, Summary for Policy Makers* (Ref. 6). The IPCC reported, with **very high confidence**, that climate change is caused by mankind, and that the globally averaged net effect of human activities since 1750 has been one of warming. The release of the report was accompanied by claims that the debate on global warming is now over, and that the case is closed. These views were endorsed by presidents of several learned societies, for example the President of the Royal Society, the President of the Australian Academy of Science, and the President of Engineers Australia, of which I am a former President. A strongly supportive movie by the American politician Al Gore was given wide acclaim, and became required viewing for politicians around the world.

There are several disturbing aspects of the IPCC report which indicate that the conclusions are based on serious misconceptions about the behaviour of the Earth. The report reflects little understanding of the dynamic relations between the Earth, the Sun, and the Cosmos. In these circumstances it is incredible that some leaders of scientific societies and academies have tried to use their authority to demand acceptance of the IPCC Report; in essence, to try to direct their colleagues to have faith, and believe, and stop thinking. I cannot recall any other occasion in my sixty years of professional activity where such attempts have been made. The claim that the debate is over is clearly being used as a device to block learned discussion. It is vital that the debate continue.

The climate of the Earth has always changed. In recent years, the understanding of natural climate change has made great progress through the spectacular advances made possible through the space program. Satellite telescopes have opened up entirely new visions of the Earth, the Sun and the cosmos, creating new areas of research. One is the understanding of the varying electromagnetic field of the Sun and its effect on the Earth.

On 19 March 2007 the Jet Propulsion Laboratory of NASA issued a press release, *NASA Finds Sun-Climate Connection in Old Nile Records*. It was announced that:

*“Alexander Ruzmaikin and Joan Feynman of NASA's Jet Propulsion Laboratory, Pasadena, Calif., together with Dr. Yuk Yung of the California Institute of Technology, Pasadena, Calif., have analyzed Egyptian records of annual Nile water levels collected between 622 and 1470 A.D. at Rawdah Island in Cairo. These records were then compared to another well-documented human record from the same time period: observations of the number of auroras reported per decade in the Northern Hemisphere. Auroras are bright glows in the night sky that happen when mass is rapidly ejected from the sun's corona, or following solar flares. They are an excellent means of tracking variations in the sun's activity. **The researchers found some clear links between the sun's activity and climate variations.** The Nile water levels and aurora records had two somewhat regularly occurring variations in common - one with a period of about 88 years and the second with a period of about 200 years. The researchers said the findings have climate implications that extend far beyond the Nile River basin.”*

The European Space Agency has recently adopted a long-term space program directed, “*to understand the solar magnetic system, its variability, its outbursts in large solar eruptions, and the interactions between the heliosphere and magnetospheres and atmospheres of the planets*”. One active program is, “*Influence of Solar Activity Cycles on Earth’s Climate*” (Ref. 5).

Thus at the same time as the IPCC and the climate scientists are claiming that the computer models of climate change now prove that Man has caused global warming over the past 250 years, and that the debate is over, space scientists and others are making quite remarkable progress in showing that the global warming is almost entirely due to natural causes. The reason for this ridiculous state of affairs is that the two groups form intellectually separate cohorts. There is virtually no debate or scientific discussion between the two, and some antagonism.

The IPCC and their vocal supporters claim that the science is proven. They see their role as advocates for public information and political action. They have unity of purpose, and a strong sense that their cause is righteous. The media is also involved, not as detached observers, but as advocates directed to stopping global warming and climate change. There is powerful pressure on industries to reduce the use of carbon fuels. Politicians in most western countries are expected to show their commitment to the cause.

All this is in marked contrast to the relatively few scientists, engineers and economists who are not convinced that Man has caused global warming. Their common cause is scientific and economic understanding. They are often criticised, quite wrongly, of being in the pay of vested interests. What the critics do not understand is that most scholars find the pursuit of truth quite exciting, bringing pleasures that money cannot buy.

But the IPCC reports are now doctrine, and there have been demands that there is to be no further debate. This brings little credit to the scientific community as a whole. I recognise that it is quite unreal to expect final agreement between the two. However, it is realistic to expect a much greater level of mutual understanding by the scientists involved. This paper is directed to that purpose.

1. THE FUNDAMENTAL ASSUMPTION

In past ages there were many great and dramatic changes to the Earth, some so great that there were extinctions of most species of animals living at that time.

Implicit in all of the IPCC work is the fundamental assumption that such natural changes have now ended, that the Earth had reached a steady state, and that man has upset that steady state by using carbon fuels in such extravagance that it has led to adverse global warming.

But the fact is that the Earth, and the Sun and indeed the Cosmos, form an interacting dynamic system, which is in a state of continuous change. Because the Earth is part of an evolving and dynamic system, there is **not** a fixed frame of reference for comparing events over historical and geological time. There is no steady state. The natural changes will continue.

2. THE SOLAR SYSTEM and THE MILKY WAY GALAXY.

The Milky Way Galaxy, of which we are a part, is a dynamic system. All galaxies in the universe are in the form of a large flat disc of stars, gases and dust, rotating like a giant catherine wheel. We cannot see our galaxy from the outside, as we are part of it. The Whirlpool Galaxy is a classic spiral galaxy, and our galaxy is considered to be similar (Fig. 1). Such galaxies are considered to be the primary form of organisation of matter in the universe.

Galaxies are incredibly large in physical extent, some hundreds of thousands light years across. They contain thousands of large stars and millions smaller, all in a dynamic state, all radiating energy which we see as glowing stars, growing by accreting gas and dust from the interstellar space. Astronomers regard such spiral galaxies as an integrated rotating system, with the clouds of gas and dust moving faster than the stars. The stars grow in size and finally explode as supernova, sending vast amounts of debris into space from which new stars begin to form. The great explosions create shock waves in the clouds of dust, and scatter radiation. The galaxies, including our own, are continually evolving.

The Earth is continually subject to cosmic radiation from our galaxy, and from the Cosmos. The cosmic radiation falling towards the Earth is partly diverted by the magnetic field of the Sun. When the electromagnetic field of the Sun is weaker, there is a higher incidence of cosmic rays. There is evidence to suggest that there are correlations between a weaker Sun, higher cosmic ray incidence, increased low altitude cloud cover, and a cooler climate (Ref. 8).

The climate of the Earth is also influenced by the position of the solar system within our galaxy, the Milky Way Galaxy. In distant geological history there is evidence that the solar system travelled through vast clouds of gas and dust which caused extreme cooling of the Earth, with ice ages lasting hundreds of millions of years. At present, and for some time to come, the solar system is travelling through interstellar space that is *virtually empty* according to Priscilla Frisch, an astronomer at the University of Chicago. The clear interstellar space is one cause of our present benign climate, which has enabled the advance of Man and the creation of our civilisation. Other changes are discussed in my recent book (Ref. 4).



Figure 1. The Whirlpool Galaxy. It is a classic spiral galaxy. It contains millions of stars and vast clouds of spirally swirling gas and dust. It is a dynamic system, where the stars are radiating energy, and growing from the accretion of interstellar debris, and finally exploding. The Milky Way Galaxy, of which we are a part, is considered to be similar. Our Sun can be regarded as similar to a bright star in this galaxy. In geological history, our Sun and solar system has travelled through similar spiral arms of gas and dust, causing ice ages lasting hundreds of millions of years. The solar system is now travelling through a large clear area between spiral arms. It has resulted in our present warm, benign climate.

3. THE DYNAMIC SUN

The Sun can be regarded as the generator of a huge electromagnetic field in space that envelops the Earth and extends into space. The Earth can be regarded as a rotating sphere of electrically conducting parts travelling through the magnetic field of the Sun. The dynamo of the Sun drives the

electromagnetic motor of the Earth. The electromagnetic behaviour of the Earth is dominated by the Sun, and this means the Sun has the dominant influence on climate.

The IPCC assumes that the radiation of the Sun is constant. Much of the spectrum of radiation of the Sun is indeed reasonably constant, but in the shorter wave lengths of X-

rays, gamma rays, and cosmic rays the energies are high and variable. It is this variability of the solar electro-magnetic field and the high-energy stream of radiation from the Sun that is the dominant cause of climate change on Earth. The climate changes can be relatively short, or extend to a century and more as in the Little Ice Age, which extended with varying severity from about 1300 to 1750. During this period, the River Thames often froze over in winter. Three years of torrential rains beginning in 1315 ushered in an era of unpredictable weather in Northern Europe which lasted for centuries. These severe climatic changes are now being

linked to changes in the solar magnetic field as deduced from sunspot records at the time.

The Sun is a churning, quivering body of hot plasma. There is continuous ejection of magnetised loops of plasma that rise to great heights and fall back on the surface (Fig. 2). There are occasional magnetic explosions that reach the earth and cause serious damage to radio and television communications, to electricity transmission systems, and to long metal pipelines.

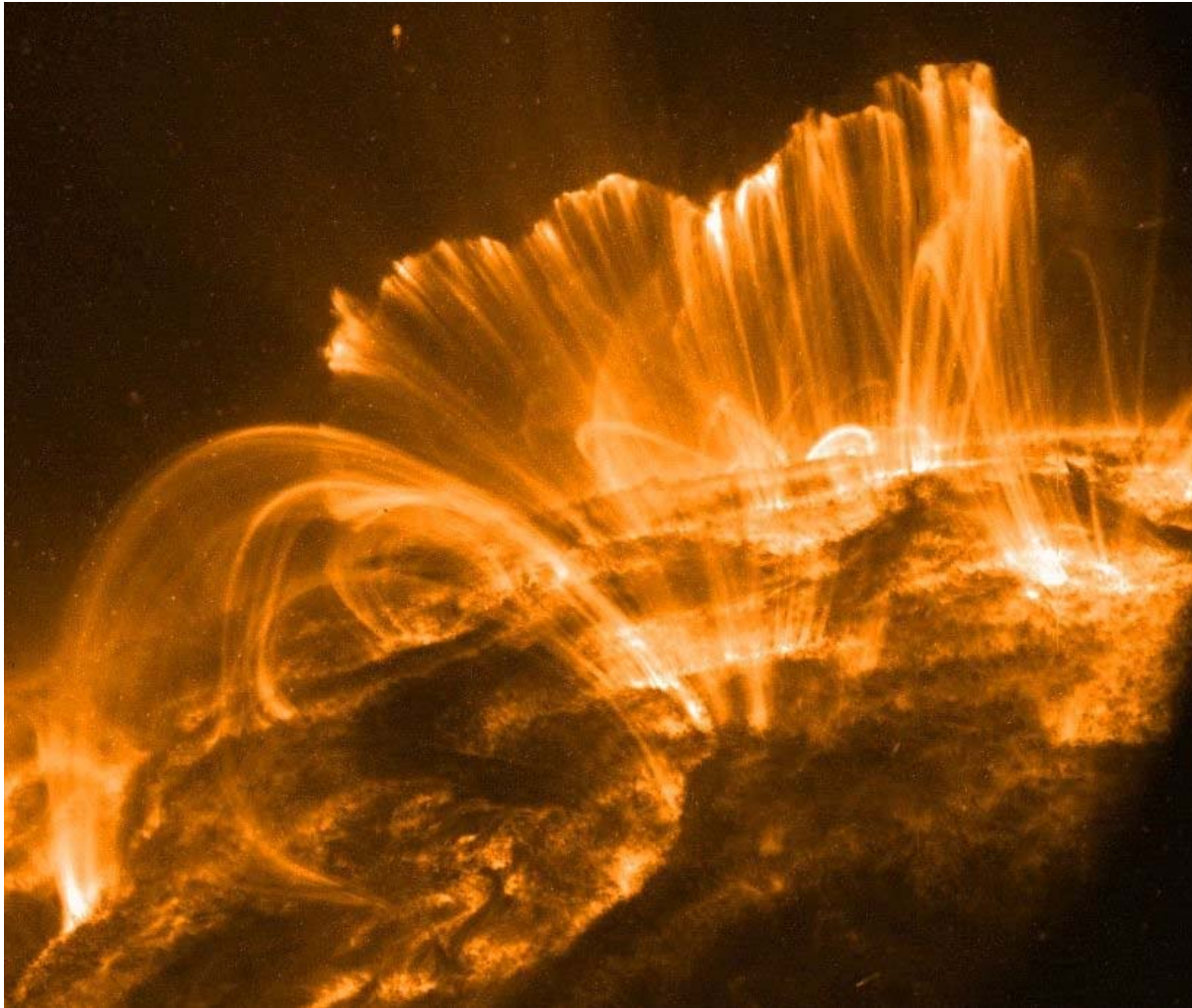


Figure 2. The corona of the Sun. Orbiting telescopes now monitor the Sun. This picture shows coronal loops of hot plasma ejected from the Sun. At one end of a coronal loop the surface of the Sun is darker; at the other end it is brighter. The dark end is magnetic negative, the white end is positive. A coronal mass ejection in this same region, hours earlier, caused a magnetic storm on Earth some 31 hours later. (Credit: TRACE Project NASA)

On the surface of the Sun there are areas of ejection of hot plasma with colossal magnetic energy which appear to be darker than the brilliance of the remainder of the surface. There are also areas of exceptional brightness, and these are

areas where the plasma stream re-enters the Sun. These dark places are recognised on Earth as sunspots.

The sunspots are an indicator of magnetic activity of the Sun. When there is a high level of electromagnetic radiation from the Sun there are a large number of sunspots. The sunspots come and go with cyclic regularity on a cycle of about 11 years, with the number of sunspots in each cycle showing a variation from cycle to cycle (Fig. 3). Over the

past 250 years the number of sunspots in each cycle has shown an overall increase.

The magnetic field of the Sun changes direction near each solar sunspot maximum. The north pole of the Sun becomes

the South Pole, and 11 years later it reverses again. Thus the total solar cycle is 22 years. This regular reversal of magnetism is further indication of the dynamic magnetic behaviour of the Sun.

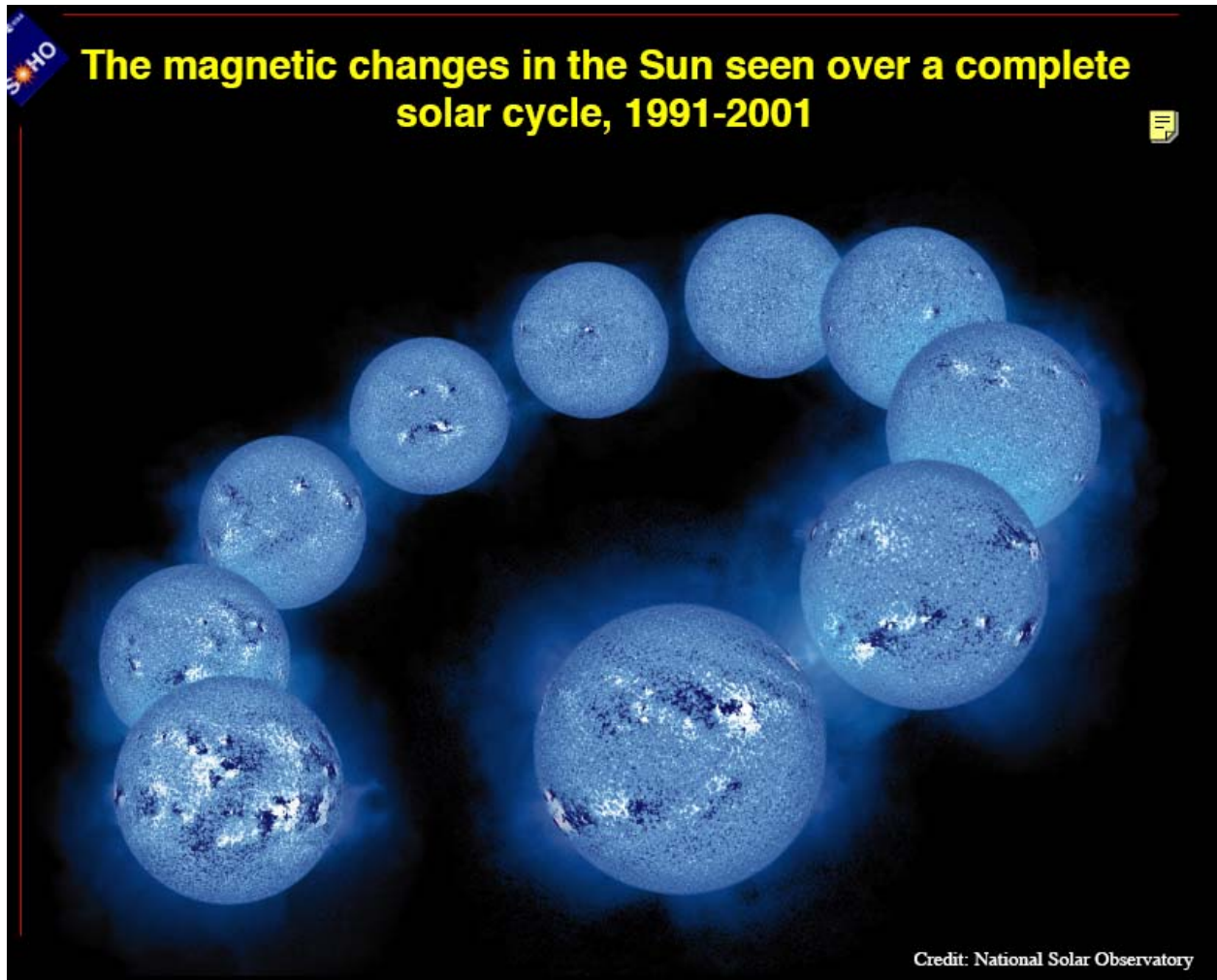


Figure 3. Changes in the appearance of the Sun from the Solar maximum of 1991 through to the next maximum of 2001. (Credit :National Solar Observatory) (The National Solar Observatory of the US Government has a website that includes a wide range of data on solar conditions).

The variation of sunspots is an indication of varying electromagnetic output of the Sun, and thereby an indication of prospective climate changes on Earth. The apparent relation of sunspots to climate has been known for centuries. C.E.P. Brooks, in the book, *Climate Through the Ages*, originally published in 1926, revised edition 1948, describes how the first record of sunspots appears in the Chinese archives of AD 188, and notes the spasmodic records on sunspots over the next 1300 years in Europe, and regular records thereafter. Brooks was a career civil servant in the Meteorology Office in Britain for 41 years. His book is a fascinating account of the study of climate in the days before computers.

Brooks lists a number of cases where the study of sunspots helped to improve understanding of climatic variations. Here are some examples:

- *In the temperate storm belts, a high sunspot number tends to be associated with low pressure, great storminess, and heavy rainfall.*
- *The annual frequency of thunderstorms shows a fairly close relation to the sunspot number.*
- *There is little doubt that some relation exists between the sunspot cycle and terrestrial (tectonic?) conditions but it is very obscure.*
- *variations in rainfall in the temperate zone ... have run fairly parallel with variations of solar*

activity shown by the records of sunspots and aurorae. (my emphasis)

Brooks mentions the records of aurorae. I noted in the beginning of this paper that a team from NASA has found that the historical variations in the flow of the Nile run fairly parallel with the records of variations of aurorae.

It is fairly clear that there is some relation between the electromagnetic activity of the Sun and climate on Earth. The demanding questions are how does this occur, is it significant, and if it is significant, should it have been included in the IPCC deliberations on Climate Change?

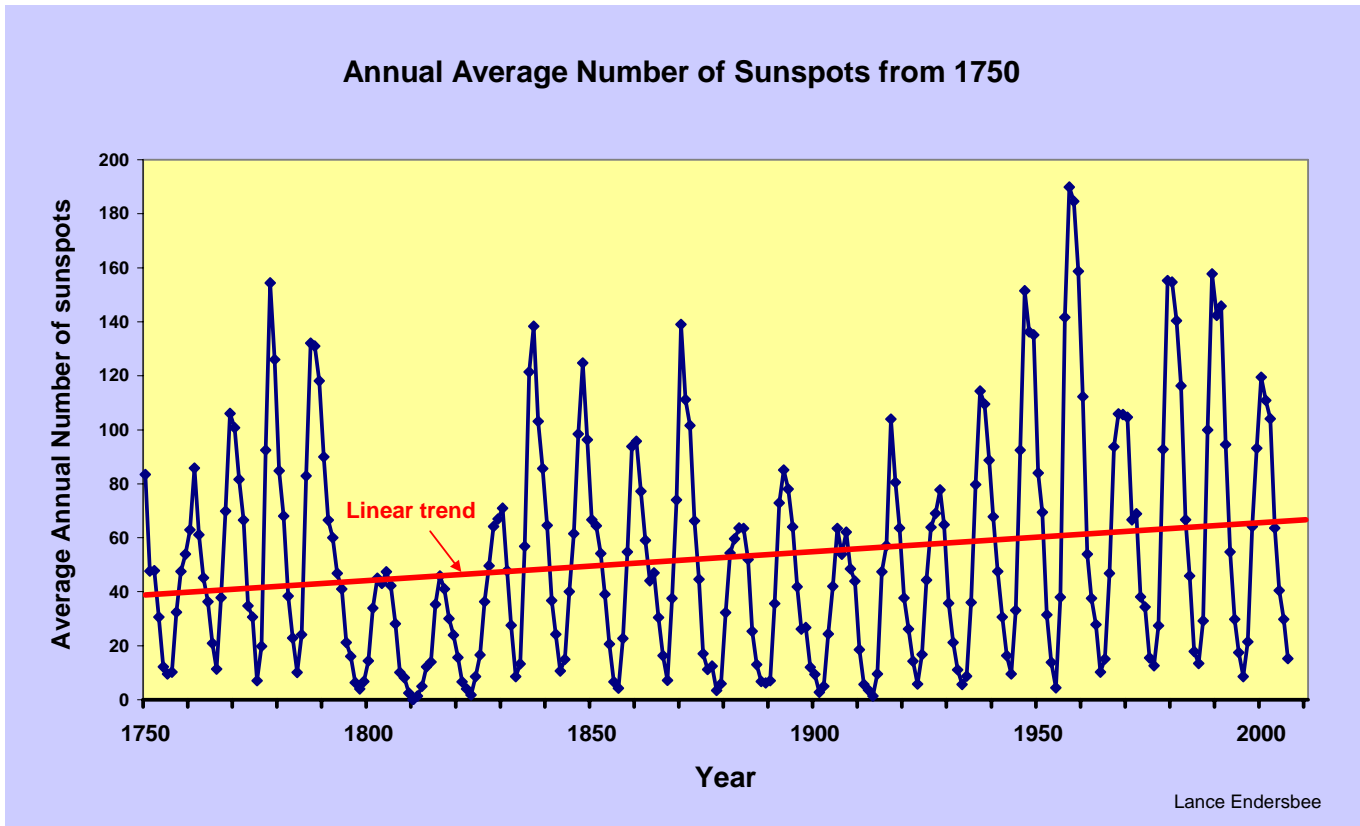


Figure 4. Average annual number of sunspots from 1750 to the present, showing a linear trendline. Note that there has been an overall increase since 1750. Earlier, from 1610 to 1715, there were virtually no sunspots, and it was a century of intense cold. Times of high sunspot counts are associated with global warming, and times of low sunspots are associated with global cooling. Thus it is reasonable from the evidence on this chart alone to assume that the changes on the Sun have been the main cause of an overall global warming since 1750.

In the period from 1610 to 1715 there were very few sunspots. This period of relative inactivity of the Sun coincided with the *Little Ice Age*, when there were decades of bitterly cold winters, short growing seasons, famine and death. Finland lost possibly a third of the population to starvation and disease. The mountain glaciers in Europe grew and threatened the villages below.

In the IPCC Summary Report, reference is made to the recent decline of mountain glaciers and snow cover, the melting of the ice sheets in Greenland and Antarctica, and overall rises in temperatures. It is claimed by IPCC, with **very high confidence**, that these are all due to global warming caused by Man.

When the IPCC claims are considered in relation to the history of sunspot data since 1750 shown in Figure 4, it is seen that the global warming may not be due to the activities of Man, but primarily due to a consistent long-term increase in solar magnetic behaviour.

The electromagnetic behaviour of the dynamic sun has an influence on the Earth in many ways. There seems to be a relationship between the flow of plasma in the ionosphere and intense thunderstorms.

In September 2006 NASA released the image in Fig. 5 and reported that they had found the *First Global Connection between Earth and Space Weather*. It was stated that 'Researchers discovered that tides of air generated by intense thunderstorm activity over South America, Africa

and Southeast Asia were altering the structure of the ionosphere”.

In another statement from UC Berkeley, ‘*The persistent, day-after-day formation of clouds and thunderstorms over the tropics has a surprisingly big effect on the Earth’s ionosphere some 200 miles above the cloud layer, according to new results from two of NASA’s satellites*

published recently by physicists at the University of California, Berkeley’.

I must admit I was surprised to note that the scientists claimed that the thunderstorms were influencing ionospheric activity. It is more reasonably a tandem effect, with the two fields of electromagnetic activity changing together in response to variations in solar electromagnetic radiation, and cosmic radiation.

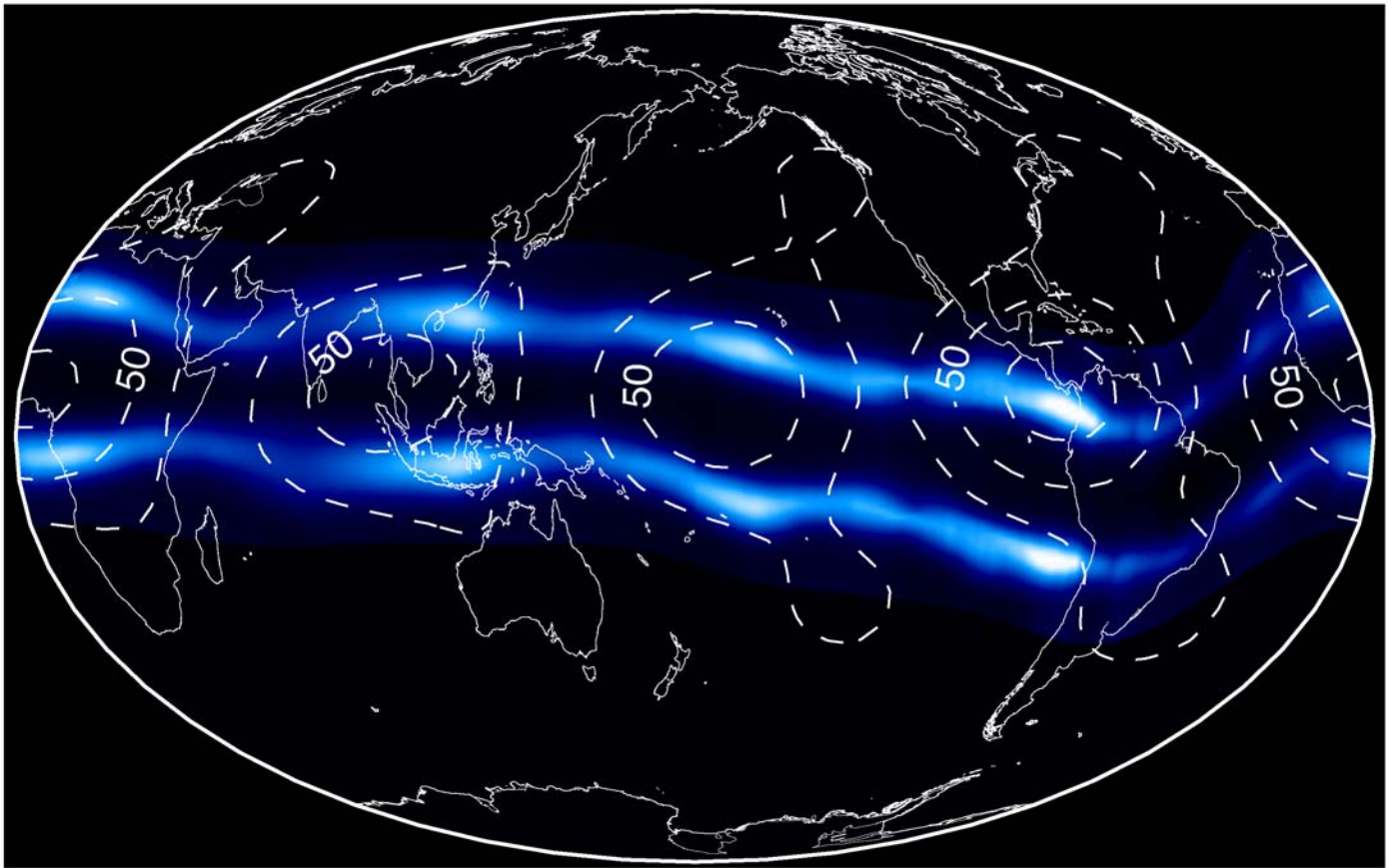


Figure 5. Two plasma bands in the ionosphere encircle the Earth some 250 miles above the equator, seen here in a false-color composite image built up from 30 days of ultraviolet observations with NASA’s IMAGE satellite. Bright, blue-white areas are where the plasma is densest. The continents are outlined by solid white lines, while the dotted lines mark regions where rising tides of hot air indirectly create the bright, dense zones in the bands. The bands seem to be associated with regions of tropical thunderstorm activity in the Amazon Basin, the Congo, and Indonesia. (UC Berkeley/NASA graphic)

There is also evidence of a relation between variations in the magnetic field of the Earth and seismic activity. In China, the Institute of Earthquake Science has found that there are ‘good relations between such rare phenomena of geomagnetic anomalies and the occurrence of earthquakes’ (Ref. 2).

Duma and Ruzhin, from Austria and Russia, report that ‘Statistical analyses demonstrate that the probability of

earthquake occurrence in many earthquake regions strongly depends on the time of day, that is, on Local Time.

Moreover, recent observations reveal an involvement of the regular diurnal variations of the Earth’s magnetic field, commonly known as Sq-variations, in this geodynamic process of changing earthquake activity with the time of day’ (Ref. 3).

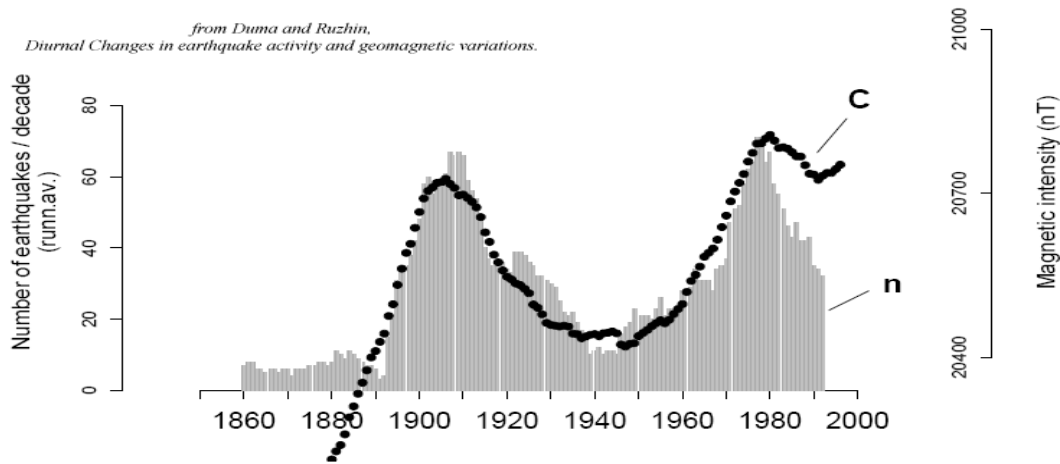


Figure 6. The number of earthquakes per decade in Austria plotted as a 10 year working average (n) compared with the horizontal component of the geomagnetic field (C). It is considered by the authors that the magnetic variations are the trigger for the seismicity. (from Duma and Ruzhin, Ref. 3).

There is much to learn in the dynamic relationships between the Sun and the Earth. One of the causes of misunderstanding of global phenomena is the difficulty in graphical representation of the related features. In many fields of earth science, including geology and climatology, a practice has developed whereby features and events that involve an appreciation of the vertical structure of the earth and the atmosphere are represented at an exaggerated vertical scale. It is common in geology to use vertical scales with a vertical exaggeration of 100 to 1 and more. Climate studies may involve even greater vertical exaggerations. In

practice it is rather convenient to use these vertical exaggerations to study the various phenomena, as the vertical differentiation of features cannot be visualised in any other way. But the emphasis created by exaggerated vertical scales can be quite misleading. The figure below shows a cross-section of the Earth drawn to a natural scale. In the scientific literature, and text books, the cross-section of the Earth is normally never shown to a true geometric scale such as in Figure 7. Yet this true scale provides an entirely different, and correct, perspective of the Earth.

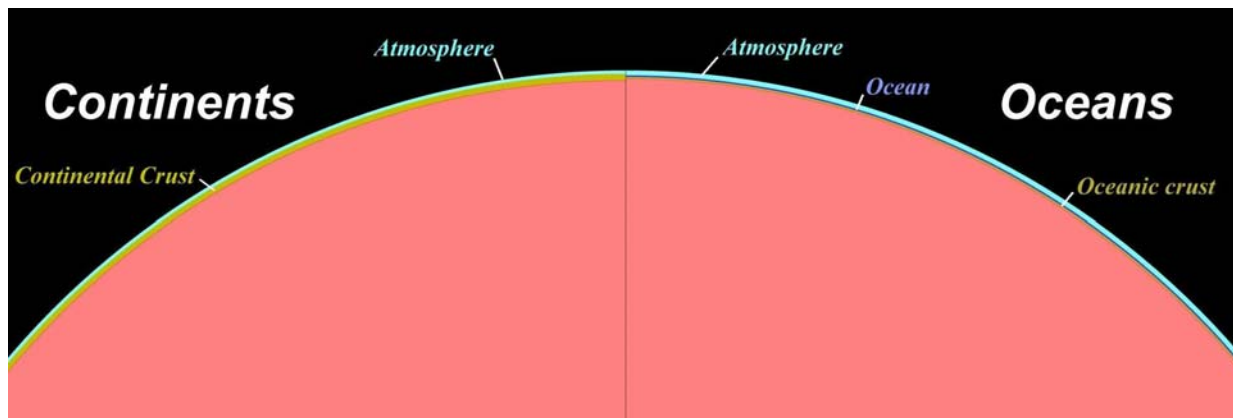


Figure 7. Diagram to show a real perspective of the crust, the oceans, and the atmosphere. It has been drawn to a natural scale. Note that the crust of the Earth, the atmosphere and the oceans are all very thin indeed in relation to the overall size of the Earth. Relative to radius, the crust of the Earth on the continents is only one third of the relative thickness of the shell of an ordinary hen's egg. The crust of the Earth over the floor of the oceans is very thin indeed, and is only one fifteenth the relative thickness of an egg shell. Similarly, the ionosphere, a layer of diffuse plasma above the atmosphere is also relatively thin in relation to the radius of the Earth. The Moho is a very thin layer of plasma forming an interface between the molten rock of the mantle and the crystalline rocks of the continental crust and the ocean floor. In geometric terms the Moho is exceptionally smooth. It shows no resistance at all to seismic shear waves; it behaves as a gas. The ionised gas in both the ionosphere and the Moho must be profoundly influenced by the electromagnetic radiation of the Sun.

The electromagnetic influence of the Sun on the Earth is more understandable in the context of the actual geometry of the Earth. The ionosphere, well above the atmosphere, can be regarded as an electrically charged layer of plasma covering the Earth. It is part of the shield that protects the Earth from the direct and powerful electromagnetic radiation of the Sun. Similarly, the Moho, the smooth interface between the molten interior of the Earth and the rocks of the continents and oceans, is also a layer of plasma.

These two layers of plasma, the ionosphere and the Moho, can be regarded as similar to the electrically charged plates of a giant capacitor, dominating electromagnetic behaviour of the atmosphere and the crust of the Earth. Lightning and thunderstorms can be understood as internal discharges within this giant capacitor. The geothermal heat flow from the interior of the Earth rising into the rocks of the continents, and into the rocks of the ocean floor, may be due to induction heating caused by electromagnetic flows within the Moho and the mantle. The Earth as we know it, from the deepest rocks to the top of the atmosphere, is contained and shielded within the electromagnetic field of these two features. Thus it is reasonable to postulate that the variable electromagnetic energy flows from the Sun have a powerful influence on the geotectonic, geothermal and geomagnetic behaviour of the Earth, and thereby, influencing climate.

The study of these phenomena has made major progress because of the space programme. We now know much more about the Sun, the solar system and the cosmos. But there is much to learn about the Earth, and in particular, the dynamic interaction of the Sun and the Earth, and the influence on climate. For example, the sunspot cycle is 11 years, and the *El Nino* cycle is also 11 years. Is there a connection?

The *El Nino* events are related in time to ocean warming events in particular regions of the Pacific. These warming regions are also areas of major seismic activity. Thus the electromagnetic behaviour of the Sun, through an influence on geothermal heat flow from parts of the ocean floor, could be the initiator and regulator of the ocean warming that forms a critical part of the *El Nino* climate cycles.

4. GLOBAL WARMING

In the Summary Report, the IPCC states that, “*Warming of the climate system is unequivocal, as it is now evident from observations in global average air and ocean temperatures, widespread melting of snow and ice, and rising global sea level (Fig. 8)*”.

There is no doubt that average global temperatures have increased, but it is important to consider where the increases have occurred, and the extent to which the increases are due to greenhouse gases or other factors. For example, there are major differences in the temperature changes in the northern and southern hemispheres.

In comparing the global temperature record with that of the northern and southern hemispheres (Fig. 9), it can be noted that they were rather similar up until about 1977-78, with each showing a linear trend with a similar rate of increase. The sunspot record since 1750 shows a similar linear trend, reflecting increasing magnetic activity on the sun, and the consequent warming of the Earth since the Little Ice Age.

After 1977-78 there is a marked difference in the warming of the northern and southern hemispheres, with the increase in annual temperatures in the northern hemisphere being more than double that of the southern hemisphere. What is the cause of this dramatic change? Is it due to Man, or electromagnetic changes on the Sun, or a significant change in the geothermal output into the northern oceans, or a combination of these?

There is a similar change in annual temperature anomalies since 1977 in global land temperatures and sea surface temperatures, with the land temperatures increasing much more rapidly than sea surface temperatures. Thus there is a reasonable agreement between the land and sea differences with the differences in the hemispheres, and it is noted that most of the land is in the northern hemisphere.

One possible cause of the differences between the hemispheres is the increasing air pollution in the northern hemisphere cities, and the urban heat island effects. These are undoubtedly factors in the increasing temperatures in the northern hemisphere, but we must note that there were no major changes in the rate of emissions before 1977 and thereafter. This leads us back to considering the solar and geotectonic changes that may have occurred in 1977, and which continued at a new rate from then on.

I have difficulty in accepting that this sharp change in global and hemispheric temperatures from 1977 was mainly due to Man. I think that there is a strong probability that the causes of the change in the northern temperatures from 1977-78 arise from some geotectonic events that led to an increase in the rate of geothermal heat flow into the northern oceans.

There must have been some geotectonic changes in the northern hemisphere leading to the increased temperatures, and I suspect it may have been due to increased geothermal heat flow from the floor of the Arctic Ocean, the Mid-Atlantic fracture Zone, or the Caribbean, or all of these. Exploration of the Arctic Ocean is revealing major areas of magmatic and hydrothermal activity that were previously unknown (Ref. 8). The global surveys of sea surface temperatures show hot spots of varying intensity along the lines of major geotectonic shear zones and lines of seismicity.

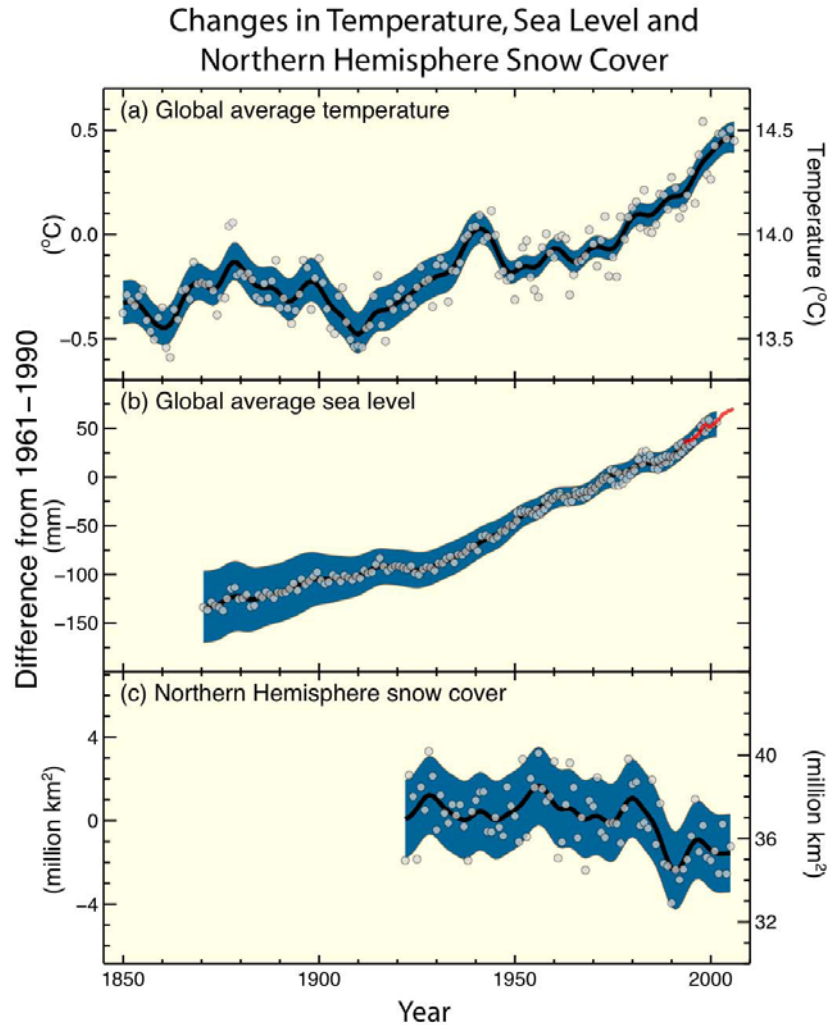


Figure 8. This is Figure S PM 3 in the IPCC Report showing observed changes in:

- global average surface temperature,
- global average sea level rise from tide data (blue) and satellite data (red)
- Northern Hemisphere snow cover for March-April in million sq. km.

The shaded areas in the graphs are uncertainty levels.

The continued surveys of the ocean floor are also revealing a large number of active undersea volcanoes, apparently many more than on land. Land volcanoes are explosive because the water in the hot hydro-siliceous magma spontaneously converts to steam with the reduction of pressure. Sea volcanoes are not explosive because of the containing pressure of the deep ocean. The hot hydro-siliceous magma simply oozes out and flows over the sea bed.

A Press Release by the US National Science Foundation on 28 Nov 2001 noted:

Contrary to their expectations, scientists on a research cruise to the Arctic Ocean have found evidence that the Gakkel Ridge, the world's slowest spreading mid-ocean ridge, may be very volcanically active. A few years ago a submarine exploration of the Arctic Ocean

under the polar ice cap found some 15 large geothermal vents along the Arctic fracture zone, and evidence of the recent outflow of lava. "We found more hydrothermal activity on this cruise than in 20 years of exploration on the mid-Atlantic Ridge", said Charles Langmuir, scientist from Lamont-Doherty Earth Observatory at Columbia University.

As I write this a research ship is heading to a part of the Mid-Atlantic Fracture Zone where there is a huge gaping hole in the oceanic floor where the normal ocean crust seems to be missing. The ocean crust is normally about 6 km thick, but in this place it is virtually nil. It is claimed that the area of the hole is thousands of square kilometres in extent. Without pre-judging the results of the expedition, it is reasonable to anticipate that this area could be found to be another new source of high geothermal heat flow into the Atlantic Ocean.

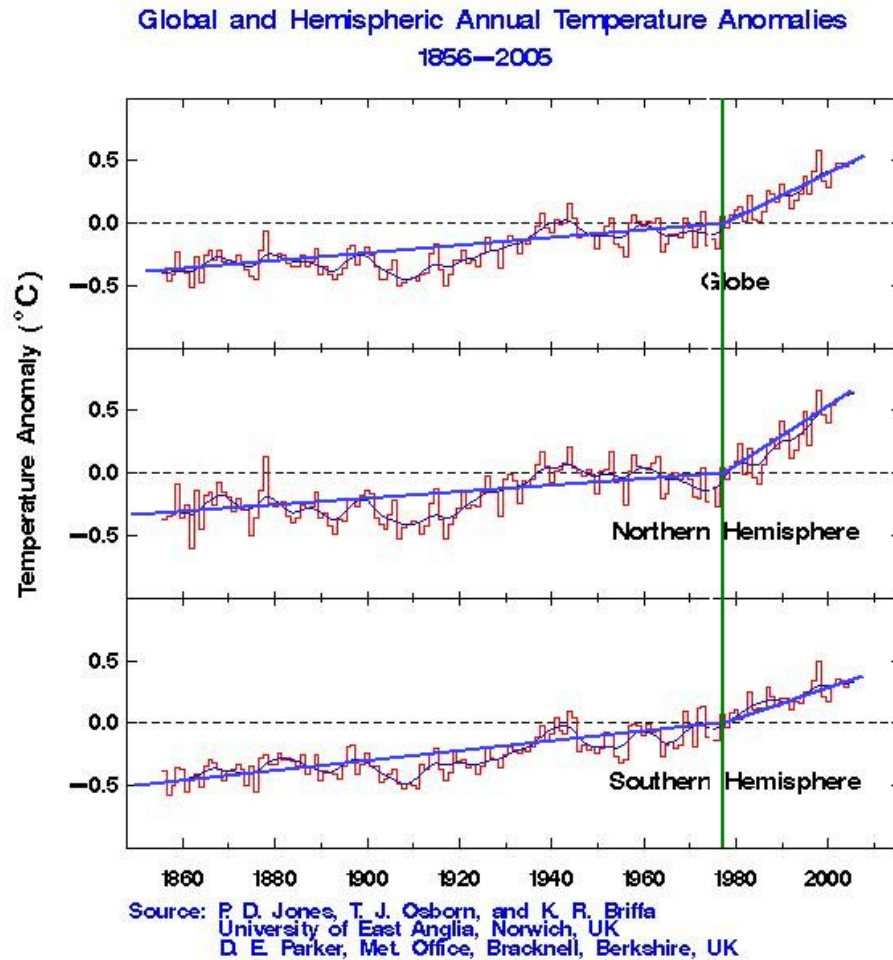


Figure 9. Global and Hemispheric Annual Temperature Anomalies since 1860 (Ref. 7). Note the major change in behaviour that occurred in 1977-78. I have drawn thick linear trend lines in blue on each of the three graphs. In the three graphs there is a fairly uniform and similar rate of increase of temperatures from 1860 to 1977-78. Thereafter temperatures grew rapidly. There is then a major difference in the rate of growth of temperatures in the northern and southern hemispheres. It is tempting to suggest it is due to the activities of Man in the northern hemisphere, but the change in 1977-8 is too abrupt for that. I think that it is due to a major geotectonic change in the northern hemisphere, which I ponder about in the text.

In my book, *A Voyage of Discovery* (Ref. 4), I describe the continuing opening of the oceanic fracture zones, the shearing displacements on fault lines at low normal stresses, and the continued release of volatiles such as water, carbon dioxide and methane. This is probably what is happening at this part of the Mid-Atlantic fracture zone. The water is evident as geothermal vents on the ocean floor, and the carbon dioxide and methane released from the mantle are simply absorbed into solution in the deep ocean.

The Atlantic Ocean is widening at a rate of about 2.5 cm each year, say 25 km in one million years, with the widening concentrated at the Mid-Atlantic fracture Zone. This rate of widening is very small in relation to the size of the hole, suggesting that the hole is quite old.

Overall, I think that we will probably find that there is a geothermal reason for the so-called hockey stick effect in the global temperature record.

5. CARBON DIOXIDE, METHANE, AND GREENHOUSE EFFECTS

In the Summary Report, the IPCC states that the present concentrations of greenhouse gases far exceed pre-industrial values, that carbon dioxide is the most important anthropogenic greenhouse gas, and that the primary source of increased carbon dioxide in the atmosphere is the use of fossil fuels. The increase in carbon dioxide in the atmosphere is an evident fact. The critical questions to be considered are whether the manmade emissions of carbon dioxide are the actual cause of the increase in levels of carbon dioxide in the atmosphere, and the actual cause of

global warming, **or** whether the global warming arises from natural causes. If the global warming is due to natural causes, it follows that the increase in carbon dioxide in the atmosphere is simply due to the decreasing solubility of carbon dioxide in seawater with increasing temperature. That is, the warming of the ocean releases carbon dioxide from solution.

One feature of the recent record of atmospheric carbon dioxide is the correlation between increasing global

temperatures and increasing levels of carbon dioxide. It is of interest to note that C.E.P. Brooks in his book of 1948 mentions that there were periods in the past when the atmosphere was rich in carbon dioxide, and that they were considered to have been uniformly warm.

Since 1959 there has been continuous monitoring of atmospheric carbon dioxide at various stations around the Earth, and the results are reasonably consistent. There has been a steady increase in atmospheric carbon dioxide.

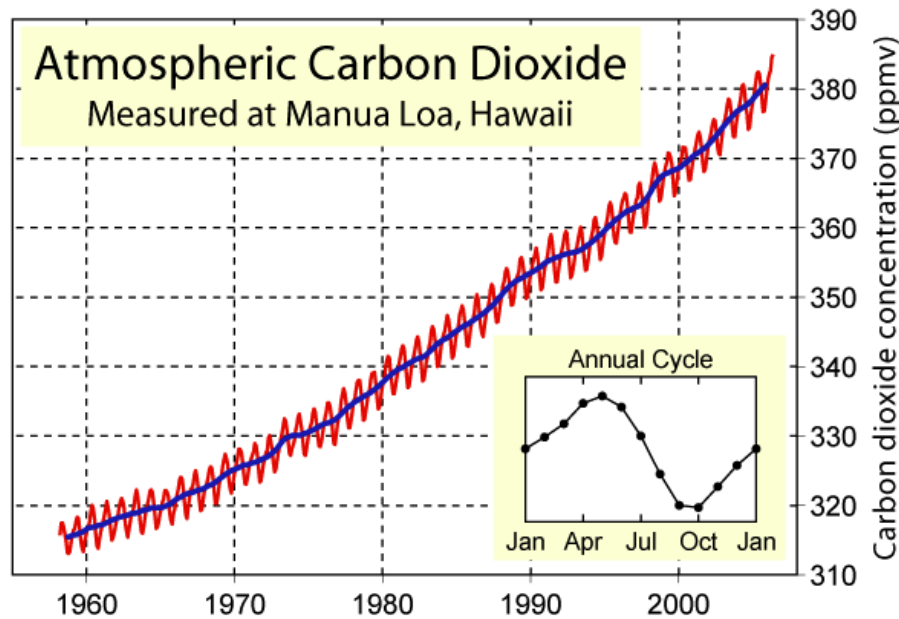


Figure 10. Atmospheric carbon dioxide measured at Mauna Loa in Hawaii. (Source: Global Warming Art, in Wikipedia).

The carbon dioxide record at Mauna Loa (Fig. 10) shows an annual cycle of carbon dioxide concentration, reaching a maximum in May, and a minimum in October each year. Thus the carbon dioxide level falls during the northern summer. This fall has been attributed to the growth of vegetation in the northern summer. But it is also the southern winter, and that is when the colder oceans have the capacity to absorb much more carbon dioxide.

There are very large sources of carbon dioxide and methane stored in the oceans. In my book *A Voyage of Discovery* (ISBN 0-646-45301-7), I describe how there is a continuing release of gases such as carbon dioxide, methane and water from the mantle of the Earth, and that it is associated with seismic and volcanic activity. The outflow from the Earth can be seen in the steam and gases released in volcanic eruptions, and the hydrothermal vents discharging into the floor of the oceans. There are tectonic shear zones throughout the oceans, and seismic displacements along

these shear zones are accompanied by the release of carbon dioxide, methane and water from the crust into the oceans. Thus the oceans have accumulated carbon dioxide and methane in solution over geological time, resulting in an overall balance of flows of these gases between the oceans and the atmosphere.

The solubility of carbon dioxide in water decreases with increasing temperature. Methane shows a similar decrease in solubility with temperature. Thus when the oceans are warmed there is release of these gases to the atmosphere. When the ocean temperatures cool there is absorption from the atmosphere. The balance is maintained every year, and has been similarly maintained over millennia. This balance of flows is evident in the annual cycle of variations in the level of atmospheric carbon dioxide, and methane. The annual variations in Figures 9 and 10 can be seen quite simply as the oceans breathing with the seasons.

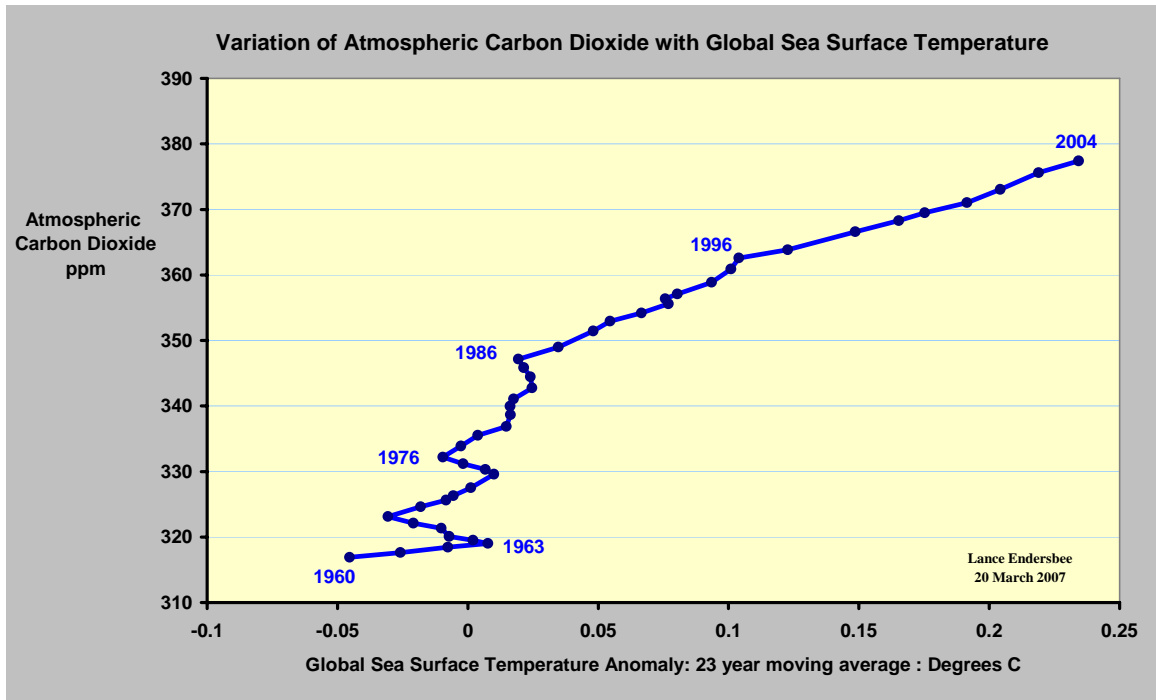


Figure 11. The average annual value of atmospheric carbon dioxide at Mauna Loa plotted against the 23 year moving average of the global average sea surface temperature anomaly. The 23 year moving average covers a complete solar cycle including polar reversals. I must admit that when I assembled the data to plot this graph I expected that the entire record would be similar to that shown for 1986 to 2004. That part of the chart shows a linear relation between atmospheric carbon dioxide and sea surface temperature. I cannot explain the behaviour from 1960 to 1986 where a large rise in CO_2 was accompanied by a small change in sea surface temperature, and with wide fluctuations. One possible reason is that the sea surface temperature data is not internally consistent. As I used a 23 year moving average, it means that the questionable temperature data is prior to 1963. I note that the data banks on sea temperatures hint of problems in reconciling sea surface temperatures from different sources until the time when the satellite observation of sea surface temperatures became routine. I can only assume that they got it right after 1963.

In view of the claims about man-made global warming, I should comment on the relative reliability of some of the sea surface temperature data in Figure 11. Over the past three decades, the advent of satellite observations of sea surface temperatures has enabled a full global coverage of the world oceans, with computer integration of data. The consistency of that data is shown in the plot from 1986 to 2004. As I used a 23 year moving average of temperature data, the plotted point for 1986 reveals a consistency of the data base from 1964 to the present.

Prior to the satellite observations, global sea surface temperatures were assessed from temperature measurements by ships as they travelled the shipping lanes of the world. There was limited coverage, and it was even less during WW2. The actual assessment of global average sea surface temperature could only be a matter of personal judgement by the responsible scientists. It was inevitable that there would be problems in reconciling the satellite data with the earlier ship records. As a consequence, later adjustments were made to the early data, and Figure 11 shows evidence of several unsuccessful attempts. That is not meant as a criticism of the officers concerned, as it was

essentially an exercise of the imagination anyway. However, I can only conclude that the data on global average sea surface temperatures prior to 1964 is simply not reliable, and should not be used as evidence for man-made global warming.

It is my view that the reducing solubility of carbon dioxide in sea water with rising temperature is the dominating influence in the increasing levels of carbon dioxide in the atmosphere. The scale of the system is important. In the cross-section of the Earth in Figure 7 it can be seen that the oceans and the atmosphere are very thin membranes, and are very shallow indeed in relation to the great surface area of the oceans. Thus the interaction of atmospheric carbon dioxide (and methane) with the oceans is essentially a surface phenomenon. It would be expected that there would be almost a direct correlation between atmospheric carbon dioxide and global mean sea surface temperatures, and that is the case. This surface phenomenon is also evident in the rapid response of carbon dioxide levels to the annual cycle of temperatures. Note that there is virtually no annual variation in the output of carbon dioxide by Man, but there

are very significant annual variations in the atmospheric record.

In these circumstances, the claim that increasing levels of carbon dioxide are causing global warming is not justified. It is the opposite; increased global warming is causing an increase in atmospheric carbon dioxide, and that is just

simply due to the reduction of solubility of carbon dioxide in sea water with increasing temperature of the oceans.

The same applies to methane, which also shows similar annual variations, also reflecting the variation in solubility of methane in sea water with temperature.

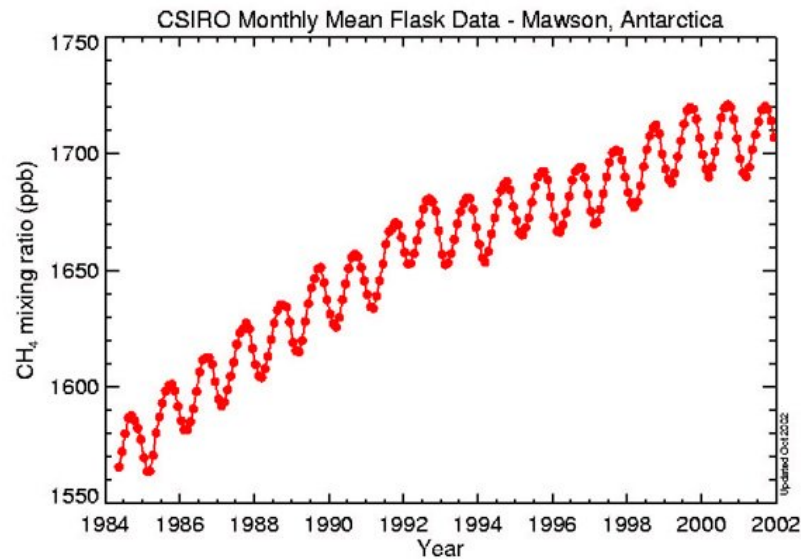


Figure 12. Atmospheric methane measured at Mawson in Antarctica. (CSIRO, Australia)

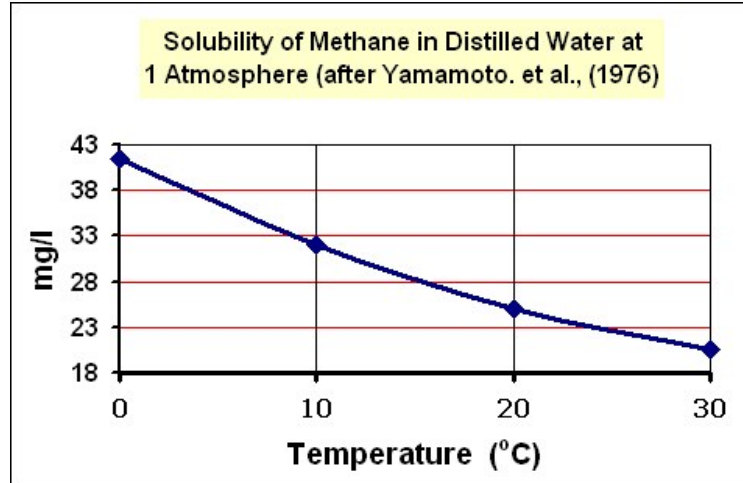


Figure 13: Solubility curve for methane in water at normal atmospheric pressure (Ref. 10).

The fact that natural variations in the levels of carbon dioxide and methane in the atmosphere result from changes of ocean surface temperatures raises interesting questions for those people who have been persuaded to invest in carbon trading. Do they get their money back if atmospheric carbon dioxide levels should fall because of lower ocean temperatures?

We should anticipate that global average temperatures may continue to rise, or to remain the same, or to fall: that has

been the case for millennia, long before any influence of Man. Thus the carbon dioxide levels in the atmosphere will also vary with ocean temperatures, without any significant influence from Man.

6. SEA LEVEL RISE

The IPCC Summary Report also presents data on the measured changes in the level of the sea over the past century. The total rise is about 180 mm, and it is suggested that this is due to global warming caused by Man.

In my recent book, *A Voyage of Discovery* I point out that over the past century there has been great exploitation of the world's groundwater resources to the extent that most of the world's water wells are drying up (Ref. 4).

About one half of the world population depends on groundwater for all or part of their water supply. The groundwater has accumulated in geological time, trapped in and below sedimentary basins. This groundwater is not recharged from surface rainfall. It is a fossil resource, and can only be replenished in geological time. Thus the world's wells are drying up due to depletion rates far in excess of any natural recovery from deep within the earth.

The total world use of fossil groundwater is estimated to be about 750 to 800 cubic km per annum. That extraction is a net addition to the hydrosphere, which eventually becomes a net addition to the oceans.

The area of the oceans is 360 million sq. km. Thus the use of fossil groundwater in the past 100 years would have raised the level of the oceans by about 2 mm/annum, which is the same magnitude of sea level rise now claimed to be due to global warming. Thus the rise of sea level in the past century can be readily explained by the addition of groundwater extractions to the hydrosphere.

7. CONCLUDING COMMENT

I began by suggesting that I believed that there were very sound scientific reasons for the debate on the causes of global warming to continue. I think it is highly probable that almost all of the global warming over the past 250 years is due to natural causes, and is not caused by Man.

On the other hand there is deadly pollution of the atmosphere in many parts of the world, and urban heat island effects that aggravate the air pollution in many world cities. These effects are caused by Man. They are mainly local and regional. This means that the solutions to these pollution effects are to be found at local and regional levels, and that means that the problems should be corrected at the source. It is ridiculous to assume that the health problems of smog in India and China have global causes, and can be solved by carbon trading in the City of London.

Carbon dioxide is not a pollutant, and it is vital for the continued life of all flora and fauna, including Man. The continued use of carbon fuels is inevitable. For many poor people in the world, access to carbon fuels offers the only salvation from famine and death. There is no need to burden electricity generation with the costs of carbon sequestration, but we can do much more to remove the nasty flue gases.

Our priority should be the reduction and control of atmospheric pollution. The control should be directed to reducing the emission of dangerous chemicals and particles that are now causing very serious health problems, and reducing life expectancy of people in most cities of the world. Such atmospheric pollution is also a cause of local climate problems, including low rainfall.

It is important to separate the causes of global warming from the causes of air pollution. The IPCC has interwoven pollution and global warming, and that is the prime cause of the log jam that has led to all the arguments. Air pollution and global warming are scientifically separate matters. I trust this short paper explains why many scientists are concerned about the IPCC reports, and why the debate should continue.

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