The chance of rain

In the upper reaches of the Murray Darling system good rains are likely in the summer. If regulators were confident that the dams would be replenished they could run them dry in the current growing season.

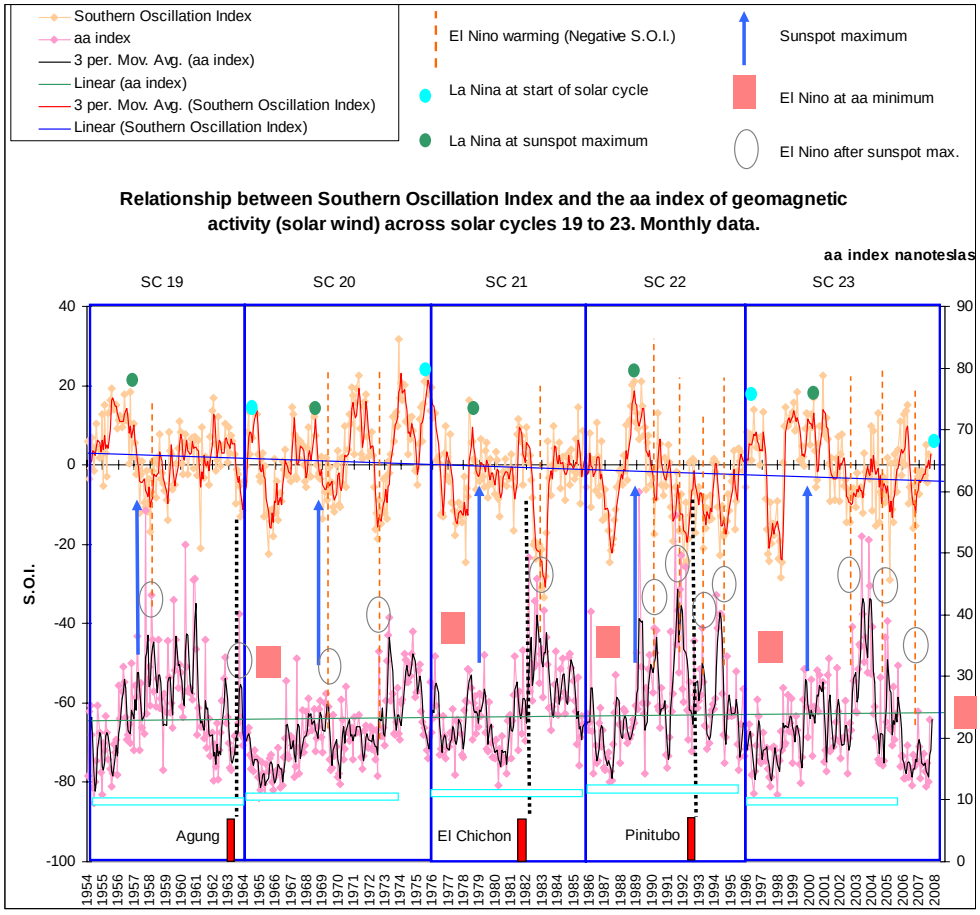
In late 2007 we see a La Niña developing, a cooling event that affects the tropics. The inter-tropical convergence declines in strength. The continents become relatively stronger centres of convection relative to the equatorial region because there is so little land to warm up in the tropics. As a result the monsoons of northern Australia, India and China strengthen. Because of the generalised cooling, tropical air is slightly closer to its dewpoint and when drawn from the tropics to cooler latitudes, rain can be torrential. There is more of this moist air about because of the slackening of convection in the inter-tropical convergence. We have already seen catastrophic floods in parts of Eastern Australia, India and Southern China in the first half of 2007. What are the chances of more rain?

The sun/earth connection – a new mechanism identified

Figure 1 has on the right hand axis, the aa index of geomagnetic activity. Monthly values are plotted and a three period moving average derived (black line). The aa index represents the degree of movement in magnetometer needles at the surface of the Earth. These needles respond to changes in the velocity, mass and density of the solar wind. There are better measures of the solar wind but this index goes back to the 1880's.

The Southern Oscillation Index is measured on the left hand axis of and its fluctuations are also smoothed using a three period moving average. The start and end points of the last five solar cycles are marked with blue lines and peak sunspot activity is indicated with a lighter blue arrow. The incidence of the major warming events (fall in the S.O.I) is shown by vertical dashed lines in orange. A conjunction of major El Niño events with a peak in the aa index is marked with a grey oval. Major El Niño events also occur in the early stages of the rise in the sunspot cycle when the aa index is at a minimum and these are marked with a pink rectangle. To make it easy to judge the relative length of each solar cycle a turquoise rectangle of standard length is inserted beneath the aa index. The timing of several major volcanic eruptions is also shown. The regular La Niña cooling events that will bring rain to the higher reaches of the Darling, the Diamantina, the Murrumbidgee and the Murray are marked with circles. You don't have to be able to read tea leaves to read this graph.

Figure 1



Source of data A.B.M. for S.O.I. and aa index http://isgi.cetp.ipsl.fr/lesdonne.htm

The relationships revealed:

1. The El Niño events that occur in the declining phase of the sunspot cycle (marked with grey ovals) are clearly associated with an increase in the aa index.
2. El Niño warming also occurs when the aa index is very low. This happens after the commencement of a new sunspot cycle. The aa index is at its lowest point and well below its trend line at this time. Interestingly, if the aa index falls below its trend line at other times it is not associated with a fall in the S.O.I. The sun has so few sunspots at solar minimum that its magnetism is consequently strong. At sunspot minimum the sun tends towards a single north and a single south pole just like the Earth. Apparently the Sun as a star emits, by a factor of 1.5–2, more solar wind mass and energy during solar minima by comparison with solar maxima years. Because the suns magnetism is strong but consistent, in the early phase of the new solar cycle, magnetic needles do not move much on the surface of the Earth. Consequently the aa index does not reflect the strength of magnetism of the sun at this time. The index is driven by the degree of *variation* in the magnetic signal from the sun. A low aa index simply reflects a lack of variability and that could be at either a high or a low level of magnetic influence. A high aa index indicates a period where swings in the power of the solar wind are frequent, implying strong magnetic disturbance, at least part of the time.
3. One set of La Niñas'(cooling events) are associated with sunspot maximum. This is probably due to the weakening of the suns magnetic field at a time of

competing polarities (many sunspots) and the additional weakening effect of the complete reversal of the suns magnetic poles at this time.

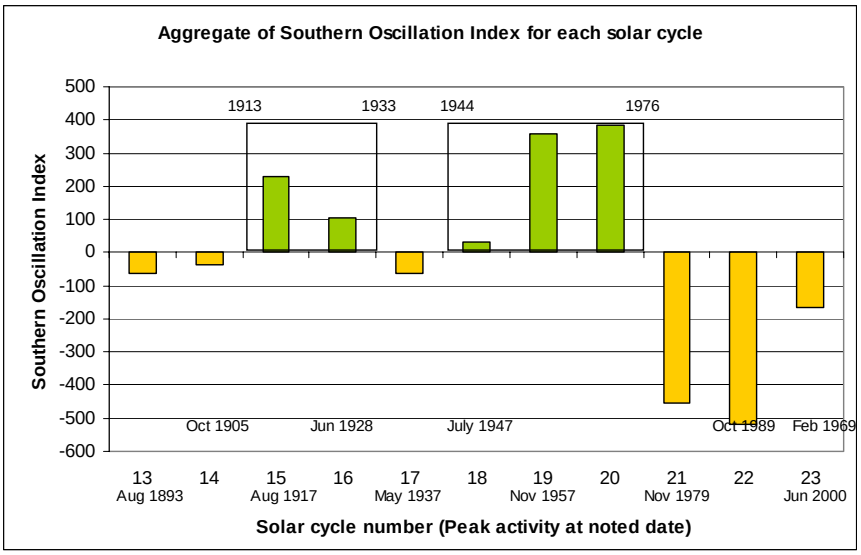
4. Another set of La Niñas' frequently occur as the aa index falls dramatically. This happens at sunspot minimum. There is a good chance that the La Niña developing in late 2007 will intensify in 2008 if the aa index continues to fall. The trend line across the low points of the aa index over recent cycles suggests that this will be the case. Sunspot activity is continuing to fall and will do so for up to a year after sunspots from solar cycle 24 actually appear. No reverse polarity sunspots from cycle 24 have yet appeared. A strong El Niño will take over, perhaps by 2009 and strengthen through 2010. Forecasts are tentative given our inability to predict the onset and strength of cycle 24. On this subject see http://www.lavoisier.com.au/papers/Conf2007/Archibald2007.pdf
5. Solar cycles 20 and 23, weak in sunspot activity, were atypically long. This is characteristic of cycles that are weaker in magnetic activity. In long cycles the Earth tends to cool.
6. The aa index indirectly reflects powerful forces emanating from the sun. Major earthquakes and volcanic eruptions are reported to be associated with high levels of aa activity. It is apparent that on three occasions since 1954 major earthquakes preceded El Niño events. For more on this recently discovered and very interesting relationship see: http://www.springerlink.com/content/753717276h869880/
7. The trend for El Niño conditions to dominate recent solar cycles is apparent in the falling trend line for the S.O.I.

Knowledge of this pattern of activity will assist in improving the art of long range climate forecasting. Inigo Jones had much success in predicting droughts. Unfortunately, the custodians of the conventional wisdom, the meteorologists of his day called him an astrologer, dismissing his work. There appears to be no record of the method he used or the reasoning behind it. For this we can thank the process of peer review.

Heating and cooling over longer periods of time

The extent to which the sun is responsible for the temperature of the planet can be gauged from figure 2 that shows the aggregate of the values for the Southern Oscillation index over each solar cycle. Barometric pressure has been recorded in Darwin and Tahiti since the 1880s. This gives us an accurate gauge of conditions in the tropics for a much longer period than we have a temperature record. The only reliable temperature record available comes from satellite observations.

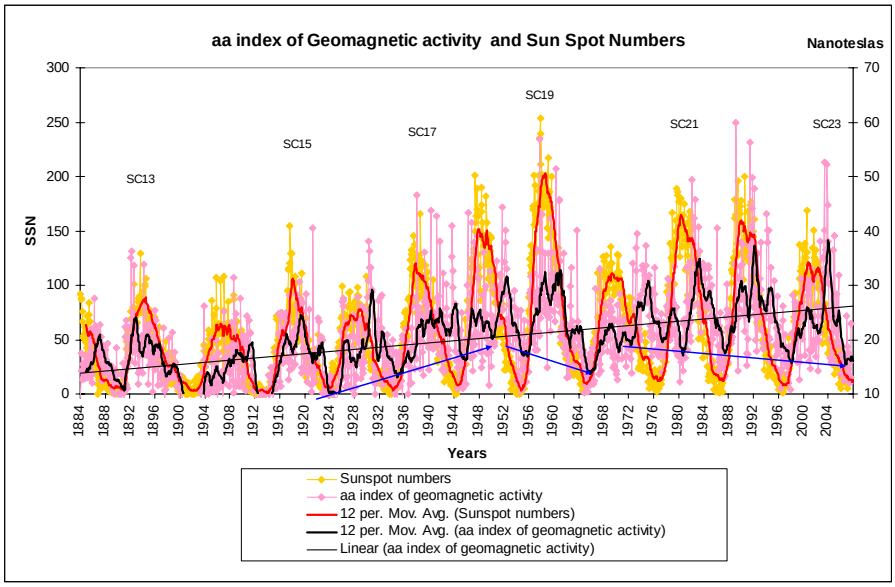
Figure 2



The period of cooling that occurred between 1944 and 1976, generally attributed to reflective aerosols in the atmosphere by the U.N. International Panel for study of Climate Change, exhibited a dominance of La Niña (cooling) conditions while the period of warming after 1976, supposedly due to an increase in the amount of carbon dioxide in the atmosphere, shows extreme El Niño dominance. It does not take much imagination to see an obvious cycle in these figures and to work out that we are headed for a period of cooling during solar cycle 24. Incidentally, it is apparent that there is no simple relationship between the height of the sunspot cycle and the tendency of the planet to warm or cool.

The relationship between the aa index of geomagnetic activity and sunspot numbers is shown in figure 3. There has been a trend for magnetometer needles to oscillate more and more as time has gone on. However, minima have been falling since cycle 19 and maxima, while energetic, are more in tune with the period of the sunspot cycle as they were in the early solar cycles when the Earth was cooler. We know very little about the causes of this variable activity on the sun. While the demand is strong for politicians to ‘do something’ to stop this warming the research priority is obviously urgent.

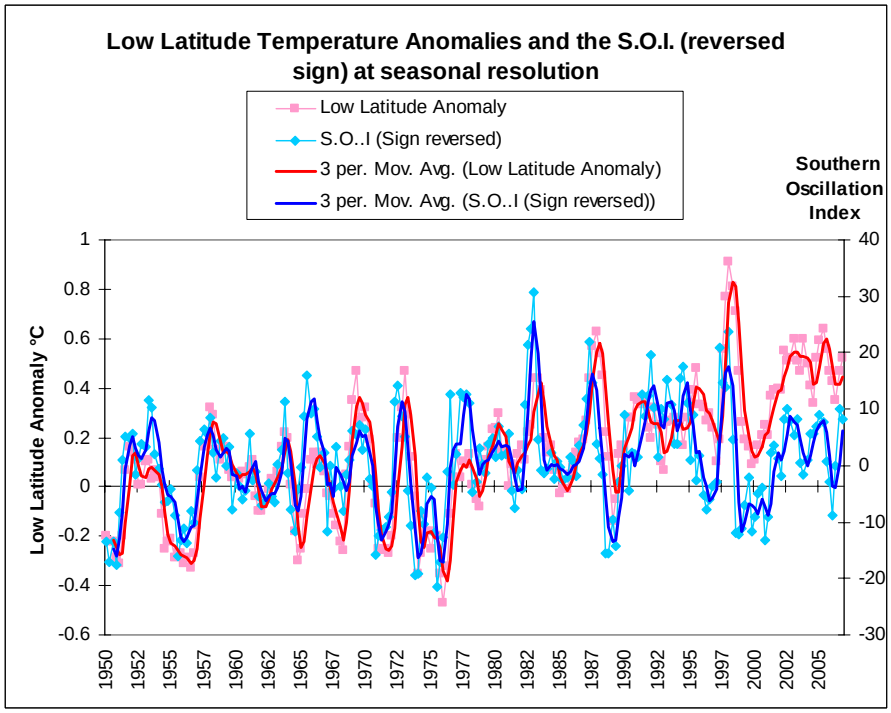
Figure 3



Source of data: aa index http://isgi.cetp.ipsl.fr/lesdonne.htm and ftp://ftp.ngdc.noaa.gov/STP/SOLAR_DATA/SUNSPOT_NUMBERS/MONTHLY

The relationship between the Southern Oscillation Index and low latitude temperatures is shown in figure 3. This relationship could only be denied by a religious fanatic or a meteorologist committed to the notion of greenhouse warming. There are plenty in both categories around.

Figure 4



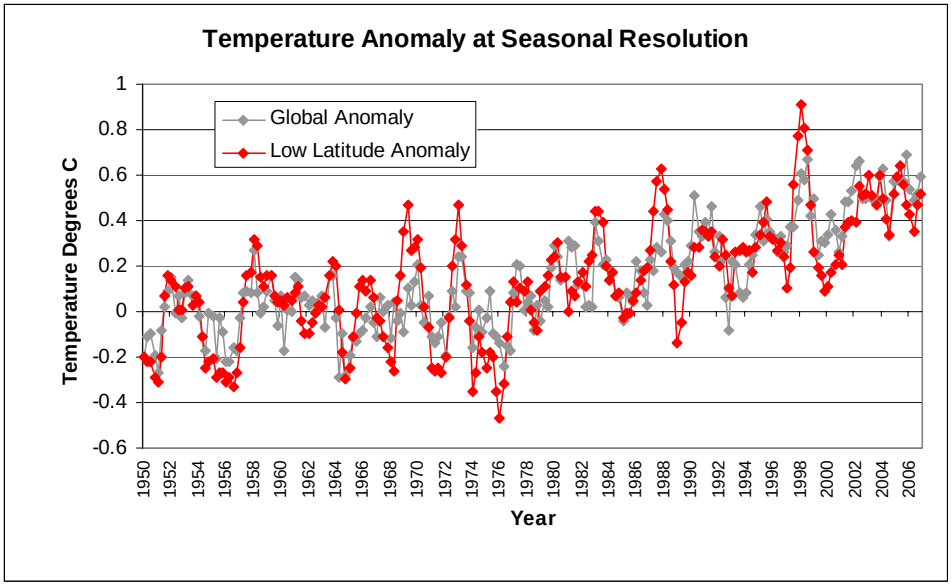
Graph by the author. Data source NASA and the Australian Bureau of Meteorology

The leading role of low latitudes in driving global temperature is apparent in figure 5. It is at low latitudes that solar insulation is most intense because it is here that the atmosphere is warmest, least dense and thinnest in terms of angular

incidence. It is here therefore that the amount of atmosphere that must be traversed by solar radiation in reaching the surface is least. It is here that the magnetic influence of the sun has the capacity to influence the transmission of solar radiation to the surface of the earth, the relationship that I have been at pains to point out. It is this relationship that is responsible for warming episodes that can persist for hundreds of years while also varying in intensity over decades and from year to year.

By virtue of the movement of warm tropical waters to higher latitudes warmth from the tropics is eventually shared with the rest of the planet.

Figure 5



Graph by the author. Source of data: http://data.giss.nasa.gov/gistemp/graphs/

Conclusion

There is a good chance of drought breaking rains in 2007 and 2008 with a strengthening of the La Niña currently underway. Over the next solar cycle and perhaps the one after that, La Niña activity should dominate as long as the pattern of relationships that has existed in the past is maintained. From the evidence in figure 2 there is no reason to expect a warming or cooling trend to be maintained for any particular number of solar cycles. Our ability to forecast changes in the temperature of the Earth will markedly improve when we can predict the strength of the solar wind that moulds the shape of the Earths upper atmosphere and determines the proportion of solar radiation that is absorbed in the tropics.

The tropics is characterised by intense interaction of oceanic, atmospheric and solar influences and it is here that the flux of energy per metre of area is greatest. The ability of the oceans of the tropics to trap and conserve this energy is facilitated by the transparency and heat storage capacity of water and the fact that there is so much of it at these latitudes. The ability of the Earth to recycle this heat depends upon ocean currents driven by the wind.

The ability of the Earth to effectively and speedily vent heat to space owes much to the evaporative properties of water and its capacity to remove heat via release

of the latent heat of condensation that drives convection. It is convection that cancels the greenhouse effect. There is in fact no glass ceiling. We can stop worrying about carbon dioxide and remember that at just 4% of the 1% of trace gases making up the atmosphere carbon dioxide is scarce plant food. It is the fertilizer in the air that will help us feed a burgeoning population.

Appendix: For those with a curiosity as to the physical forces at work, here is my guess as to the nature of the mechanism by which the sun determines whether the tropics will warm or cool:

The solar wind is helium, produced by thermonuclear process in the sun, carrying a variable magnetic signature that depends upon its zone of origin on the surface of the sun. This disturbs the rarefied upper atmosphere of the Earth, a zone extending from the stratosphere upwards towards the edge of the Earths magnetic field, some three to six Earth diameters in a sunward direction, its distance depending upon the relative strength of the Earth's magnetic field vis a vis that of the sun. Regular electromagnetic radiation, including visible light as a small fraction of the total, travels at the speed of light (300,000 km /sec). The solar wind is slower at between 400 and 1000 kilometres per second. In the Earths 'ionosphere' where gas molecules and ions interact at a density that is a tiny fraction of that at the surface of the Earth, electrons are energised by UV radiation to the point where they escape from molecules and atoms of nitrogen and oxygen. The ultra violet radiation that is responsible for this ionisation, changes in intensity by a factor of two to ten times over the solar cycle. Upon the degree of ionisation of the upper atmosphere depends the degree of reflection of short wave radio signals beyond a horizon determined by the height of radio antennae.

The upper atmosphere is an electromagnetic ocean, awash with magnetic influences. When the ionosphere is swept by the solar wind, a wave of material is repelled from the equatorial area, where the Earths magnetic field lies parallel to the Equator, and is driven pole-wards peaking in a continuous wave or 'fountain' that appears at about 20° of latitude north and south. Solar UV radiation then penetrates much lower into the atmosphere and ionises the D layer, probably accenting the process. This wash of ions very likely entrains atmospheric gases and in doing so thins the atmosphere across the tropics, allowing a greater proportion of solar energy to reach the surface. As a result the amount of solar energy that can reach the surface increases. On an average for the globe as a whole only 47% of the energy of solar radiation that is coming our way is absorbed at the surface, perhaps more in the tropics and less at high latitudes. More solar radiation is lost to scattering and absorption in the atmosphere and reflection from the surface than is absorbed. If a little more gets through in the tropics the warming starts. Once started, this warming process is likely to reduce atmospheric density and allow an even higher proportion of radiation to reach the surface. Some factor of this sort must be responsible for the change that occurs in the surface temperature in the tropics that coincides with surges in the solar wind. One could liken this to a variable heat shield effect that depends upon the strength of the solar wind.

A variable heat shield is the antithesis of the greenhouse effect. As a hypothesis the former better explains the pattern of temperature increase that we see. The heat gain is

in the tropics. It timing is intermittent rather than gradual. It is in the lower atmosphere that the greatest heat gain has occurred, consistent with the role of water vapour in transporting heat into the troposphere where it can be readily dissipated to space. This is so effective, due to the power of convection and secondly to the thin veneer of atmosphere that we have, that temperatures in the upper troposphere at about 8- 10 km en elevation have not increased at all. The penetration of water vapour into the stratosphere, with the continual run of extreme El Niño heating events since 1976 has humidified the stratosphere reducing its ozone content and the amount of particulate matter resident there. Consequently we have witnessed a steep fall in the temperature of the stratosphere, greater in extent than the degree of warming at the surface.

The evidence is very much against the greenhouse model of anthropogenic warming and it can safely be consigned to the scrapheap of history along with the theories of Lysenko. How did western science fell in love with this idea? Is it the fag end of our fascination with the notion of original sin or does it reflect a deep seated anxiety with the social malaise that followed the invention of the birth control pill, the availability of sex without commitment and the decline of the family as a social unit? Or, is it not scientists that are to blame, but rather the activists who write the 'Summary for Policy Makers' in the U.N. I.P.C.C. reports. Perhaps it is the media craving sensationalism, needing to sell papers and pull in advertising revenue and hungry to write the agenda for political activity. Perhaps it is the 'issues based' curricula that we have fed our kids for the last forty years that makes them such suckers for silly ideas. Did someone say that a little education is a dangerous thing? Perhaps, rather than force feeding our kids with the tenets of a green religion we would be better to go back to something neutral like Latin and Greek.

One thing that we should do is to examine the structure that makes it difficult for new ideas to see the light of day. Perhaps there should be a pink section in the back of every academic journal that is devoted to a paper that could not survive the process of peer review. Some of those papers might look a bit like this one. If references are not quoted it might just be that the idea is new.

Erl Happ 24th September 2007 email erl@happs.com.au