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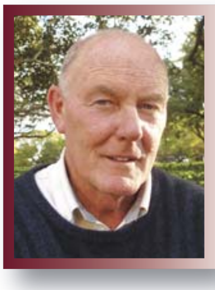
El Niño warming



Erl Happ

HAPPS AND THREE HILLS
MARGARET RIVER, WESTERN AUSTRALIA

I have a sticking point with the 'science of global warming'. It's not global. In fact, it is confined in the main to the Northern Hemisphere. If 'greenhouse theory' were correct, warming would be seen in all places and in all seasons. But, the advance in temperature is mostly in the winter and spring. There is an obvious cause for this and it's the heat stored in the oceans as a result of episodes of tropical warming that are described as 'El Niño' events after the most obvious manifestation in the Pacific Ocean. In brief, this is the situation as I see it:

- In the Southern Hemisphere there is very little warming but a lot of drying due to the expansion of the cloud-free area of the tropics we call the 'Hadley Cell'. This is due to the increase in sea surface temperatures across the tropics.
- In Antarctica, temperatures at the South Pole have been falling since 1957 when the US base 'Amundsen Scott' was established. Warm air ascending in the tropics is balanced by cold air descending on Antarctica, the coldest place on Earth. The islands of the South East Pacific near Peru have been cooling for 100 years. The big solar cycle made up of nine individual 11-year cycles is 100 years. We are getting to the end of that 100-year cycle. In the last year, sunspots have almost disappeared, the tropics have cooled and Antarctica has started to warm.
- The Earth is closer to the sun in January than in July so there is an extra 90 watts per metre of solar radiation, an increase of 7% over the July figure. The Southern Hemisphere is more ocean than land. Ocean is a good heat absorber because it is transparent. The land is a fast emitter. That's why average global temperatures 'as measured in the atmosphere' are higher in July than in January.
- The tropical ocean is warmest in April at the end of the Southern Hemisphere summer. That provides the pulse of warmth to heat the Northern Hemisphere in December-January when the average global temperature over land falls to 3°C. It takes about six months for the waters of the Gulf of Mexico to arrive off Britain.
- Man is a land-dwelling animal. This is where the complaints are coming from. The fishes seem to be happy enough. The whales need to feed in the Antarctic and birth their young in the tropics because the newborns have not the fat to keep them warm. Life is a little easier for them now that the ocean is warmer.
- Over the last 30 years we have had one El Niño event after another. Prior to that we had 30 years of one strong La Niña event after another. This pattern is apparent in Figure 1 where we aggregate the Southern Oscillation Index for each solar cycle. Furthermore, it is very likely that the changes that occur in the tropics drive the Pacific Decadal Oscillation Index which is correlated with changes in climate (and fish populations) in the North Pacific.

In Figure 2 we see how short wave energy, which is responsible for the heating of the stratosphere, drove strong warming between 1976 and 2001. The stratosphere has since cooled. Why does the heating of the stratosphere not follow the sunspot cycle more directly? That is a story for another day. It has to do with the solar wind that affects the density of

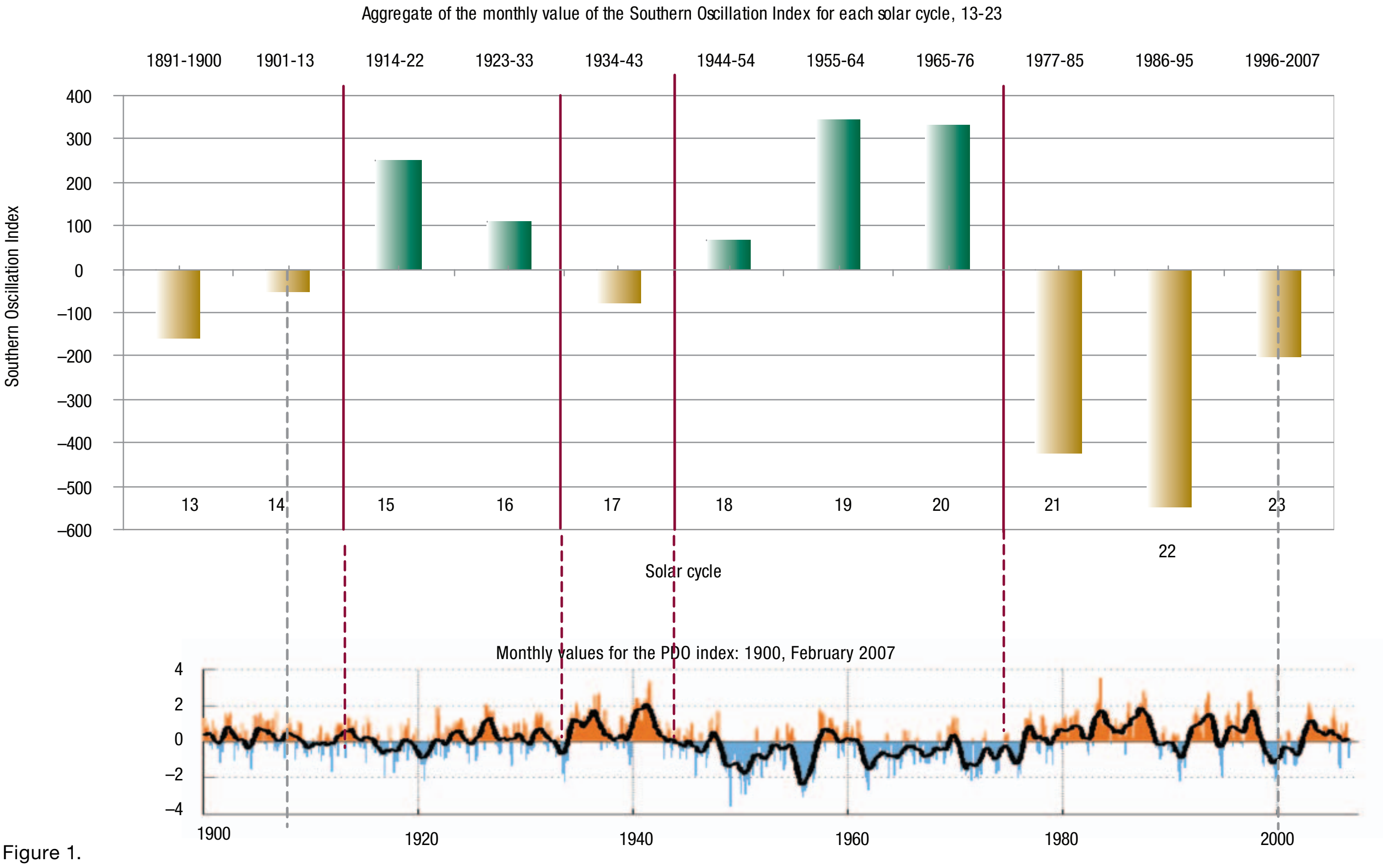


Figure 1.

the upper atmosphere over the tropics and the strength of the Earth's magnetic field.

Figure 2 shows that the temperature at the 200hPa level in the upper tropical troposphere moves similarly to the temperature at 10hPa, with reduced amplitude of fluctuation. However, temperature at 200hPa has a much greater range of fluctuation than temperature at the surface, indicating that it responds to the same solar driver responsible for temperatures in the stratosphere. At 200hPa the altitude is about 11km and about 80% of the mass of the atmosphere is beneath. Air pressure is about one-fifth that at the surface and the temperature is –50°C. Here, cirrus cloud exists as filaments of highly reflective ice. Given the small amount of water vapour at this level, about 2% of that near the surface, the ice that forms has a disproportionate impact on the Earth's albedo, its ability to turn away solar radiation.

The temperature of the air determines its capacity to hold water vapour and over longer spans of time, specific humidity (the actual amount of water in the air) should increase with temperature. If it does not, a fall in relative humidity will occur, clouds will evaporate and the sun will heat the ocean strongly.

What happens under high UV light intensity? The correlations reported in Figure 3 are based on a moving parcel of five years reported on the third year. Temperature anomalies are based on a mean of the entire series stretching from January 1948 through to May 2008. The data relates to a latitude 10-20°S. This is that part of the ocean subject to the most intense

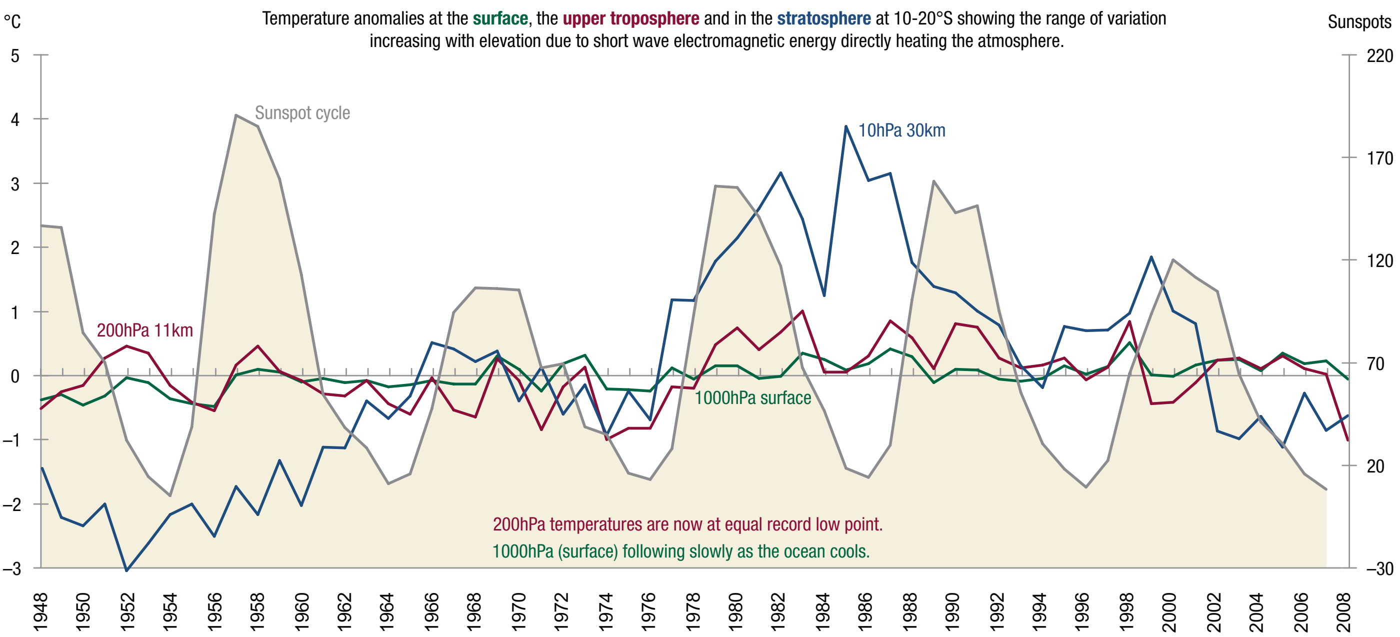


Figure 2.

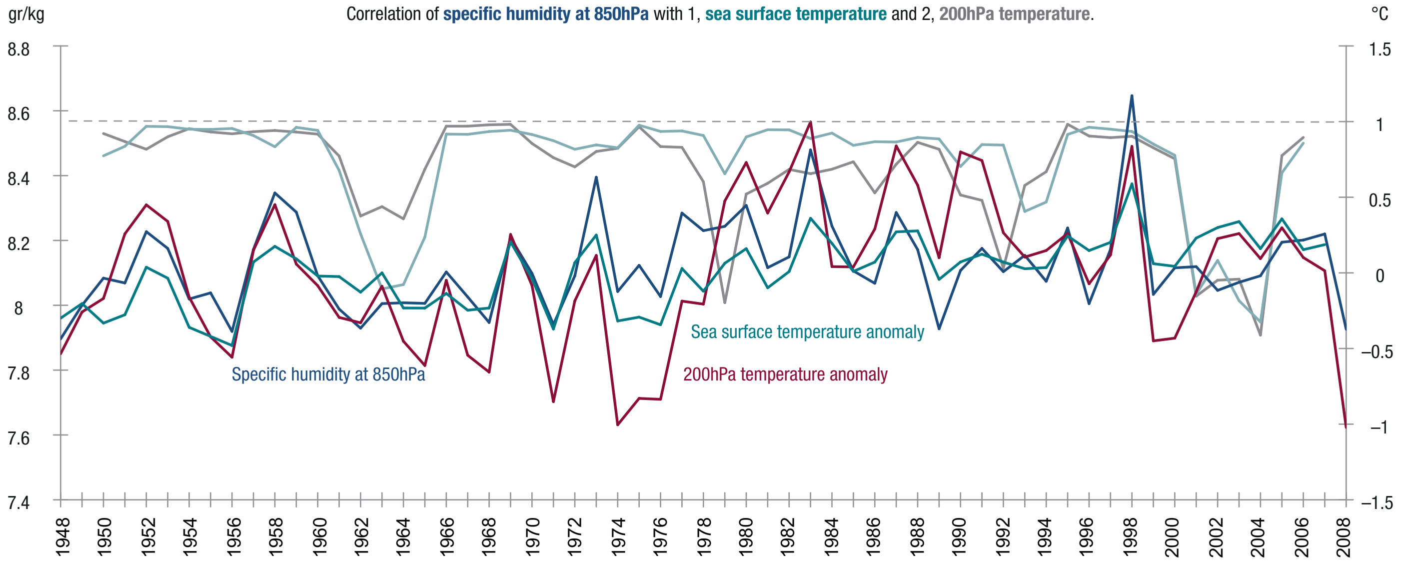


Figure 3. *Data for temperature and specific humidity from http://www.cdc.noaa.gov/cgi-bin/Timeseries/timeseries1.pl; accessed 2 July 2008.*

radiation in January when the Earth is closest to the sun. It's a stretch of ocean little interrupted by land. Each of these temperature peaks represent an episode of warming in the tropics that drives up sea surface temperatures and six months later warms the North Pacific and North Atlantic.

The period between 1960 and 1967 is atypical because a steep decline in both sunspot activity and the solar wind in the descent from the peak of solar cycle 19, the largest of the last 100 years to solar cycle 20, one of the smallest, drove continuous cooling. Volcanic eruptions in 1959 (Kilauea) and 1965 (Agung) assisted by filling the stratosphere with reflective aerosols. Interestingly, 200hPa temperatures provide the best correlation with surface-specific humidity within the period.

A correlation co-efficient higher than 0.8 is rare in climate science but here we have coefficients close to perfect. Figure 3 shows that specific humidity near the surface is directly related to temperatures at 200hPa and the correlation is highest when 200hPa temperature is lowest. When temperature at 200hPa blows out the correlation falls away. The cirrus cloud does not then come and go with the rise and fall in temperature. Average cloud cover diminishes under heating pressure. A reduction in low level cloud follows as specific humidity fails to keep pace with the rise of air temperature accelerating the warming started by the loss of high level cloud. In short, the Earth's natural thermostat works poorly when UV radiation is too intense. The intensity of the UV spectrum is directly related to sunspot activity. Too much UV, and the Earth loses its protective cloud cover and warms strongly. When UV intensity falls away between sunspot cycles, periodically within sunspot cycles and when sunspot cycles are weak, tropical cloud cover recovers and the La Niña pattern is established. This feeds into cooling in the high latitudes of the Northern Hemisphere.

With an understanding of these relationships it is plain to see that recent warming, and the current cooling is due to the sun. It is also possible to attempt some long-range forecasting. Some caution must relate to the fact that we have little idea what drives the 11-year solar cycle, let alone the 100 and the 200-year cycles. Some observers think that the planets are involved but we do not know enough about the structure of the sun to perceive a causative mechanism.

CLIMATE FORECAST AND IMPACT ON AGRICULTURE

Low sunspot activity will allow cooling at 200hPa and a relatively heavy layer of cirrus cloud will be maintained over the tropics. This will reduce the penetration of solar radiation to the surface. The tropical oceans will gradually lose warmth and the air above them will lose moisture due to precipitation and reduced evaporation from a cooling ocean. Precipitation events will shift in part from the tropics to the sub-tropics, including Australia.

For December 2008 much snow is predicted for Canada, Europe and Siberia. If solar cycle 24 does not get under way before April 2009, it will be even colder in December 2009. Budburst on grapevines will be very late and cherries will not set well, as seen in the Okanogan Valley in British Columbia this spring. Frosts will devastate parts of the Napa and vines may freeze in Washington State. In China, just like last winter, we will see more snow. Europe will cool more slowly because there is much warm water locked up in the North Atlantic. The UK should expect heavy rain and a continuation of the floods experienced recently.

What about Australia? The weak solar cycle 20 from 1964-74 saw deep La Niñas, cool temperatures and abundant rainfall right across the country. Look forward to more of the same over the next 30 years. Strong El Niños will occur but the balance between cooling and warming will be more favourable. The next warming event will come with the upswing of solar cycle 24, probably late 2009. With the persistence of cycle 23 spots and the paucity of cycle 24 spots we are probably still a year off solar minimum. We are also at the tail end of a 100-year cycle and a larger 200-year swell in sunspot activity and three small 11-year cycles are now expected.

Australian wheat farmers have planted a record crop this year. Rainfall should be good and that crop will mature well if not frost affected and this should assist in the re-establishment of communities that have fared poorly over the last three solar cycles. With the cooling of the Northern Hemisphere, there will be a strong demand for the produce of the Southern Hemisphere. Already the price of wheat has doubled. The US corn crop is in jeopardy due to a late start and heavy rain. This will feed into the price of livestock.

GRAPEGROWERS

Australia is a warm continent and grape flavour suffers when there is too much heat. There is no better demonstration of this than vintage 2008. Trusted advisers are telling farmers to look for later ripening varieties for the inland and that is sound advice. Every year will be different and each will bring unique challenges. It's a big country. This summer, the East and the West were cool to mild while the centre sweltered as air was drawn southwards from the northwest. It rained in the desert in summer time. There was a photograph of Uluru, gushing with streams of water on the front page of *The Australian* newspaper in the middle of summer. Rainfall should improve because the country is generally wetter in La Niña years. Winter and spring frost will increase. Predicting the climate is a chancy business because what happens is conditioned by the amount of moisture in the atmosphere. A big El Niño event puts a lot of heat into the oceans and that increases evaporation and prolongs the following La Niña. A prolonged La Niña dries the atmosphere and increases the intensity of the following El Niño. There is no 'normal' within the span of a human lifetime and these events do not disappear when the sunspots diminish. The evidence is that the cold episodes are more extreme in the low sunspot cycles.

CONCLUSION

Greenhouse theory does not stack up. 'Tropo' in 'troposphere' is Greek for 'turning'. If the surface of the Earth heats up the troposphere turns faster and eliminates heat more efficiently. At an average depth of 10km, the troposphere is very thin. Moving air will not hold heat. Even in the warmest places, the nights can be cool. It is the ocean that is the real store of warmth and it is the coastal places that stay warmer overnight and in winter. Carbon dioxide is less than one-twenty-fifth of 1% of the air that we inhale. It is a much larger fraction of the air that we exhale. Are we to breathe less deeply and exercise less vigorously to reduce our carbon footprint? Carbon dioxide is what the plants need to make them grow and that is why it is scarce. While we have plants it will always be scarce. More carbon dioxide enables plants to grow faster and use less water. This will help to green the deserts. Let us not confuse environmental religion with observational science. Reliable science explains what we observe. One can not understand the climate system without an appreciation of the influence of geography, spatial relations, ocean currents and the physics that drive cloud cover over the tropics. We have managed to banish religion from politics. Now we need to do the same for science.