

The Analysis of Temperature

It is possible to explain much of the temperature rise in Australia during the twentieth century as being due to one event, the Great Pacific Climate Shift of 1977 when the temperature jumped by 0.5⁰C. This has no connection with anthropogenic carbon dioxide and such future changes cannot be predicted by present climate models.

Analysing temperature behaviour in Australia and on a global scale has become the bellwether of global warming analysis. Deep suspicions are voiced over the results from the five groups that analyse global temperatures from ground stations, balloons and satellites. In fact it is probably remarkable that there is so much agreement on measurements and in science it is not surprising that there is so much disagreement on interpretation.

It is comforting to know that in Australia much the same game can be played. But the game here is played on one set of measurements, that of the Bureau of Meteorology, so it is all about interpretation.

In the paper¹ “Observed climate change in Australia over the past century” Nicholls and Collins, of the Bureau of Meteorology, state:

“...It seems likely that much of the warming is due to increased atmospheric concentrations of greenhouse gases....”

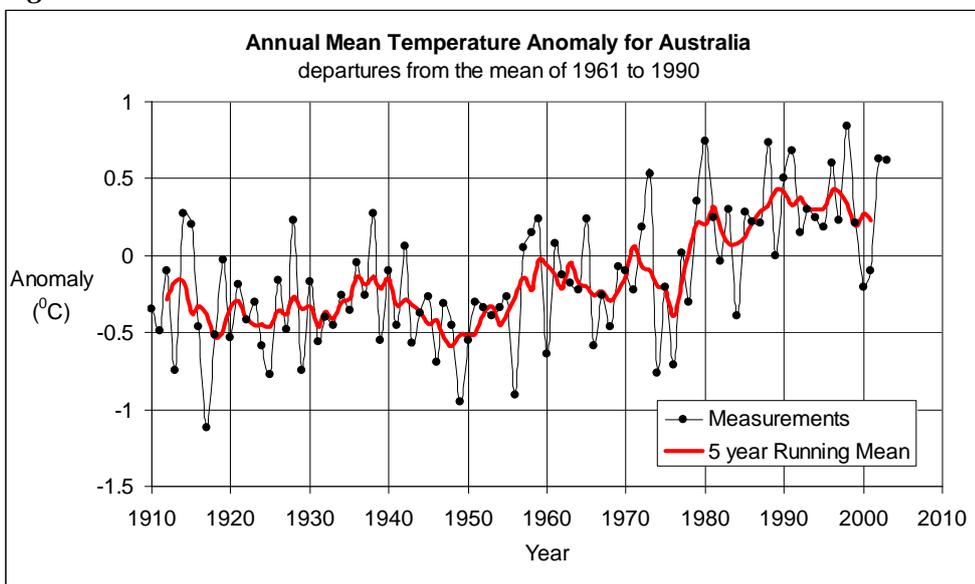
This statement draws on modelling results by Karoly et al that indicate most of the temperature rise is compatible with increasing anthropogenic CO₂.

The analysis is worth examining by returning to the data².

In the Nicholls and Collins paper, annual temperature anomalies are analysed from 1910 to 2003. The temperatures shown there are annual mean minimum and maximum temperatures, together with continuous curves showing a five year running mean of both series.

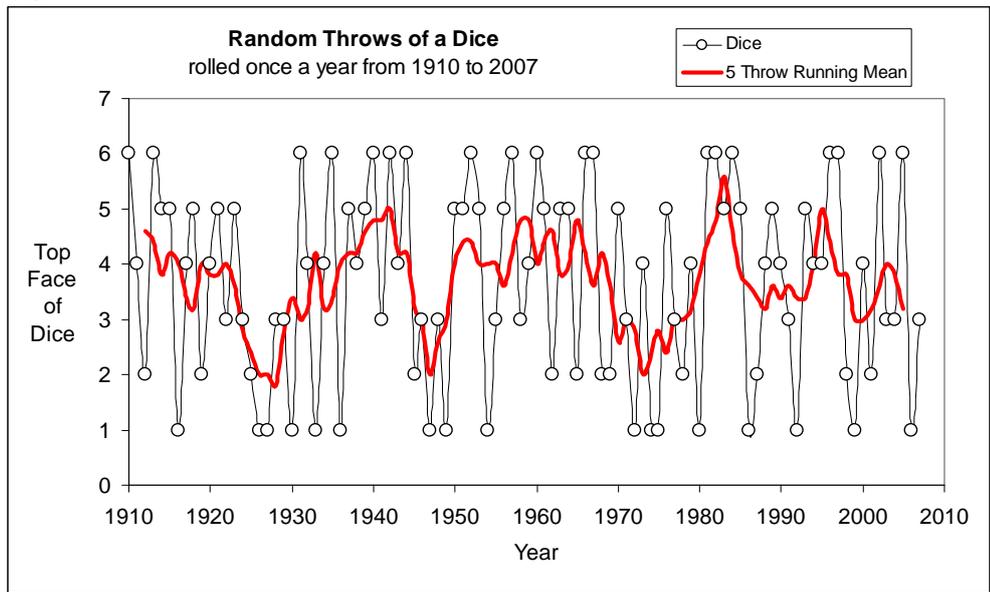
Figure 1 below is drawn from the same data set but shows annual mean temperatures. In addition it shows the five year running mean. The eye is led by the running mean, but statistically, with average fluctuations of 0.3⁰C from year to year and no strong correlation of year on year temperature change for most of the data, this has no value.

Figure 1



If a six sided dice were thrown to simulate a random series and the mean of five consecutive throws plotted as a running mean were calculated, then the result would be as shown in Figure 2.

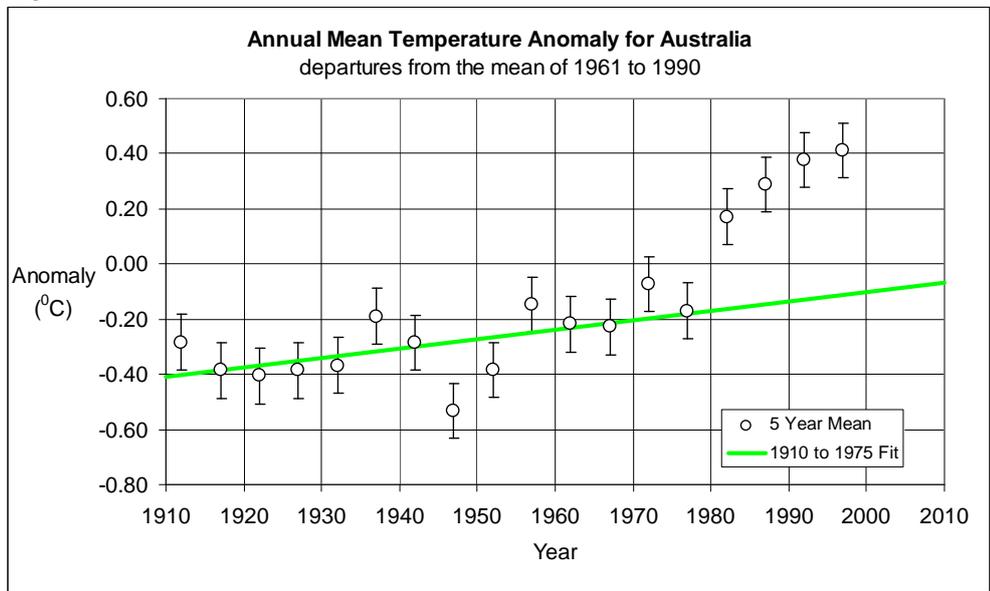
Figure 2



This demonstrates the use of running means can be quite misleading as a representation of trends. It also shows that substantial multiple year variations are possible in a system such as the climate-weather system with large annual variations.

Keeping to the spirit of five year averages, Figure 3 shows the annual temperature anomalies as separate five year annual means: that is 1910 to 1914, 1915 to 1919 and so on.

Figure 3



A constant temperature anomaly of -0.30°C would fit all the measurements up to 1980. In fact the straight line shown is a best fit for 1910 to 1975 and gives a rise of $0.34 \pm 0.17^{\circ}\text{C}$ per century. The errors shown are standard errors of the mean values. They cover, as you would expect, the running mean values of Figure 1.

The most remarkable feature in Figure 3 is the difference of the temperatures after 1980 from the projected temperature trend. The difference is some four standard errors and is statistically very significant. There is an apparent temperature shift of 0.5°C in the late 1970's

The temperature step is connected with the Great Pacific Climate Shift of 1976³, an event whose origins are uncertain but widely acknowledged, even in IPCC reports.

Back in 1976, the Pacific Ocean underwent a major transformation in sea surface temperature patterns. Suddenly warm water replaced cold water that had dominated the sea surface for most of the prior three decades near the west coast of North America and along the equatorial eastern Pacific.

In 1997, researchers at the University of Washington reported that a multi-decadal oscillation in Pacific sea surface temperature and pressure had been discovered, while trying to explain decadal changes in salmon fishery production. They called it the Pacific Decadal Oscillation. They noted that a major shift had taken place after 1976 from what they termed the cold mode to the warm mode of the oscillation.

It is often discussed as a possible source of Australia's temperature change.

This interpretation shows that for Australia the best description of the warming in the twentieth century is the major contribution of 0.5°C coming from the Great Pacific Climate Shift. The causes of the balance of the temperature change, 0.3°C , remain uncertain.

The temperature shift has nothing to do with anthropogenic CO_2 nor could such changes be predicted by present climate models.

¹ Neville Nicholls and Dean Collins 2006: "Observed climate change in Australia over the past century" Energy & Environment Volume 17, No.1, 1

² Tom Quirk 2009 "The Australian temperature anomaly 1910-2000", Energy & Environment Volume 20, No. 1+2, 97

³ Michael J. McPhaden and Dongxiao Zhang 2002 "Slowdown of the meridional overturning circulation in the upper Pacific Ocean", Nature vol 415, 303.