The Australian Temperature Record - The Big Picture

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This is part 8, essentially a wrap-up - see all other parts 1-7 here: http://kenskingdom.wordpress.com/.

"…getting seriously fed up with the state of the Australian data."
(Harry the mystery programmer, in the HARRY_READ_ME file released with the Climategate files.)

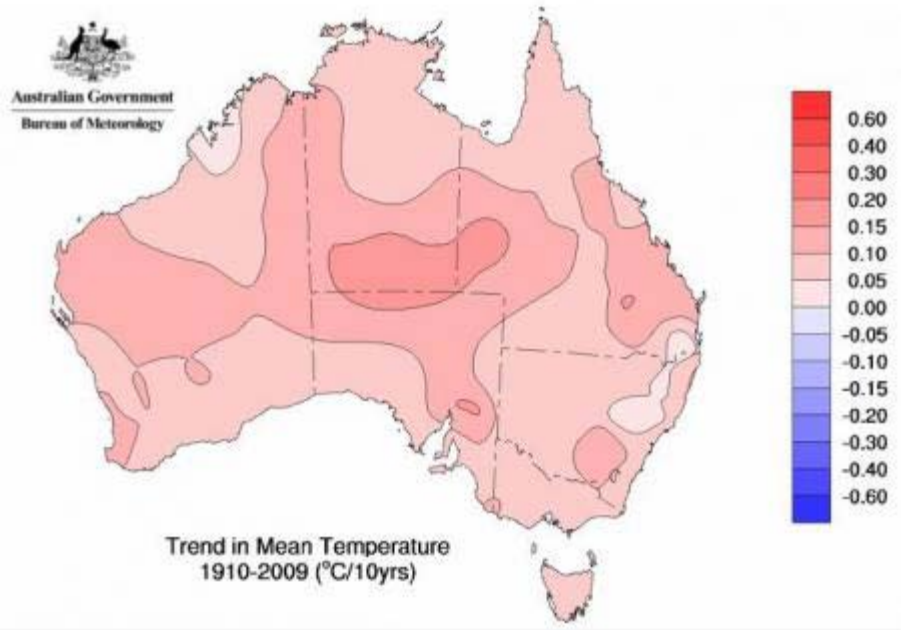
He's not the only one. In a commendable effort to improve the state of the data, the Australian Bureau of Meteorology (BOM) has created the Australian High-Quality Climate Site Network. However, the effect of doing so has been to introduce into the temperature record a warming bias of 41.67 %. And their climate analyses on which this is based appear to increase this even further to around 66.67%.

This post is the summation of what I believe is the first ever independent check on the official climate record of Australia. It is also the first ever independent check on the official record of an entire continent.

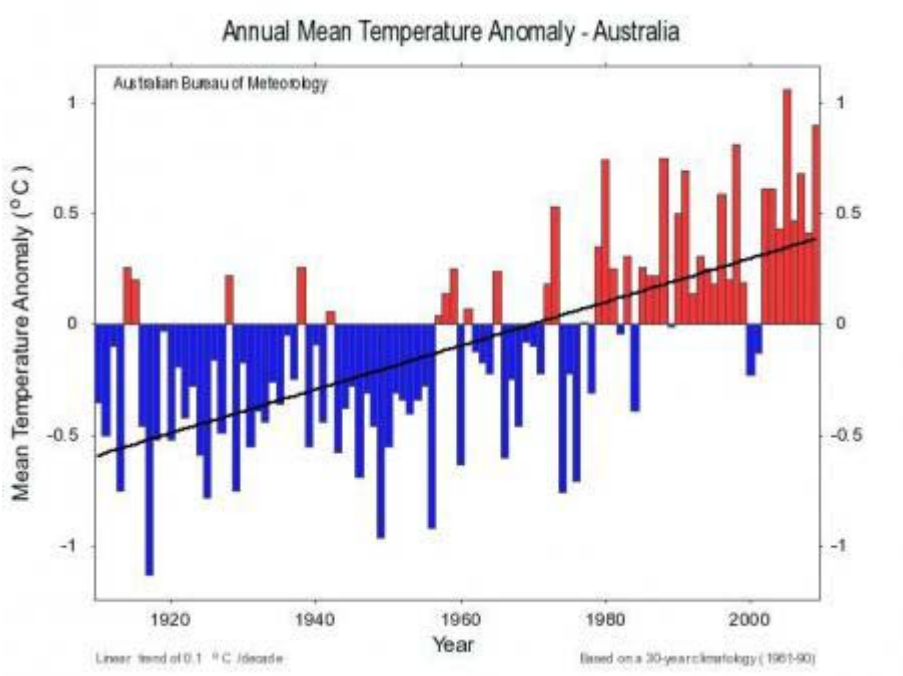
I will try to keep it simple.

Here is the official version of "the climate trends and variations in the Australian instrumental record" published for the Australian public, the government, and all the world at http://www.bom.gov.au/climate/change/aus_cvac.shtml.

Trend Map, 1910-2009:



Time Series Graph using their handy trend tool:



0.1 degree C per decade, or 1 degree per100 years.

In the BOM website appears this explanation:

The temperature timeseries are calculated from homogeneous or "high-quality" temperature datasets developed for monitoring long-term temperature trends and variability ……. Where possible, each station record in these datasets has been corrected for data "jumps" or artificial discontinuities caused by changes in observation site location, exposure, instrumentation or observation procedure. This involves identifying and correcting data problems using statistical techniques, visual checks and station history information or "metadata".

and

"High-quality" Australian climate datasets have been developed in which homogeneity problems have been reduced or even eliminated.

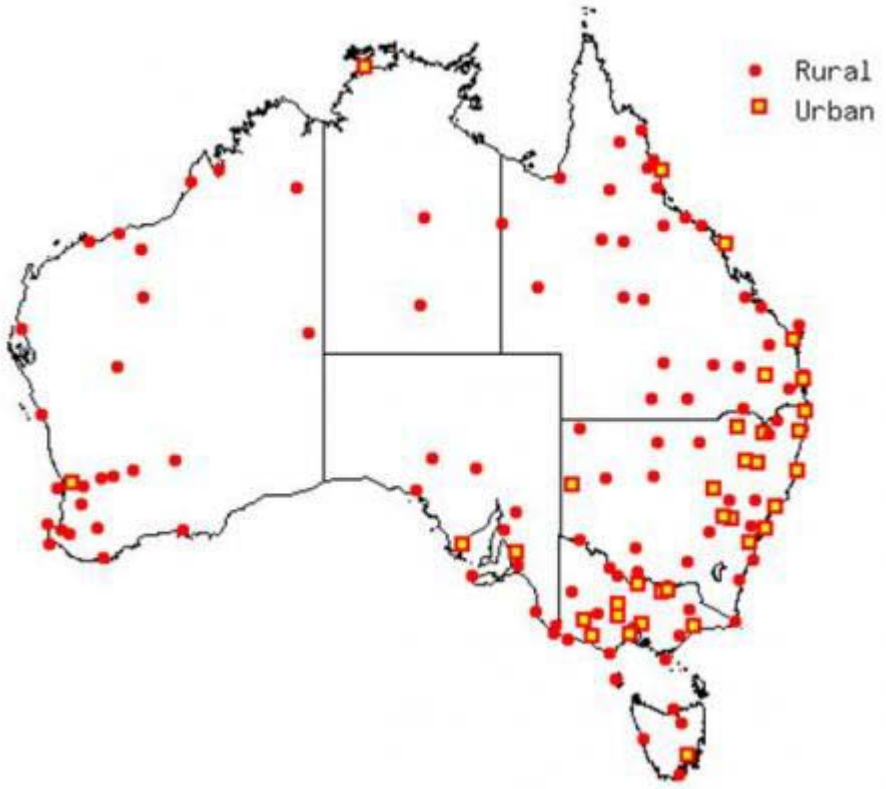
I have given a very brief summary of this process in http://kenskingdom.wordpress.com/2010/05/12/the-australian-temperature-record-part-1-queensland/.

(I should point out that this method was changed somewhat by Della-Marta et al (2004) who also used a distance weighting method as well and included some urban stations and stations with much shorter records.)

Torok and Nicholls (1996), authors of the first (published) homogenization, rightly state that

"A high-quality, long-term surface air temperature dataset is essential for the reliable investigation of climate change and variability."

Here is the map showing the 100 currently used High Quality stations that supposedly meet this requirement:



Before my first post, I asked BOM to explain some of the odd things I had noticed in the Queensland data. Amongst others, this statement by Dr David Jones, Head of Climate Monitoring and Prediction, National Climate Centre, Bureau of Meteorology, in an email dated 25 April 2010, caught my eye:

"On the issue of adjustments you find that these have a near zero impact on the all Australian temperature because these tend to be equally positive and negative across the network (as would be expected given they are adjustments for random station changes)."

This statement has been the yardstick for this study.

Not having access to the list of stations, the metadata, the software used, or the expertise of BOM, the average citizen would normally accept the published results as they stand. However I wanted to have a closer look. Surely the results of any adjustments should be easy to compare with the previous record.

I downloaded annual mean maxima and minima for each of the sites from BOM Climate Data Online, calculated annual means and plotted these. Frequently, two or three stations (some closed) were needed for the entire record from 1910-2009, and even then there sometimes were gaps in the record- e.g. from 1957 to 1964 many stations' data has not been digitised. (But 8 years of missing data is nothing- many stations have many years of estimated data "filled in" to create the High Quality series). I also downloaded the annual means from the High Quality page, and plotted them. I then added a linear trend for each.

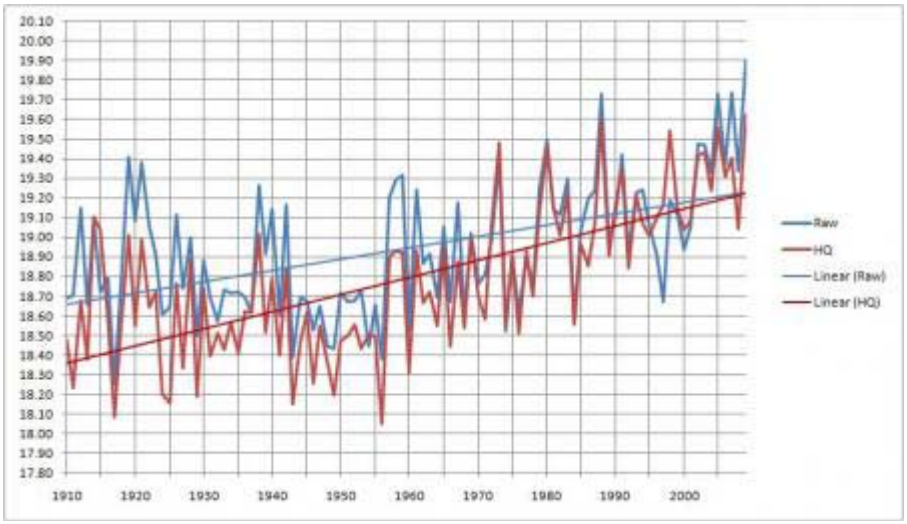
I have exhaustively rechecked data and calculations in all 100 sites before compiling this summation. I have decided to amend only one, Bowen, by creating a splice by reducing early data and omitting some data, so that the trend matches that of HQ. This is on the basis of no overlap at all, but makes the plot lines roughly meet. Unsatisfactory, and Bowen should be excluded. The net effect on the Queensland and Australian trends is negligible (0.01 C).

Let's look at Dr Jones' assertion for the whole of Australia.

"…a near zero impact on the all Australian temperature …"

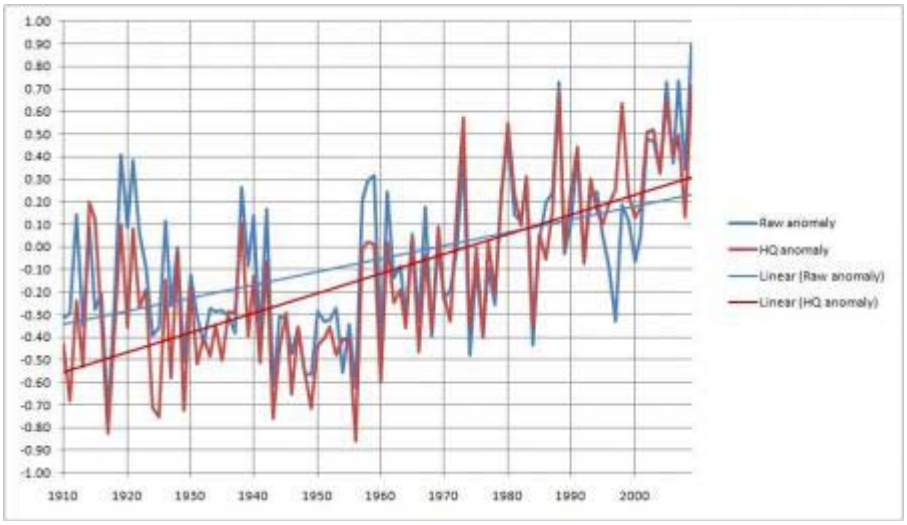
WRONG.

We can look at the record in a number of ways- here is the graph of the average raw and adjusted temperatures for all 100 stations. The discrepancy is obvious.

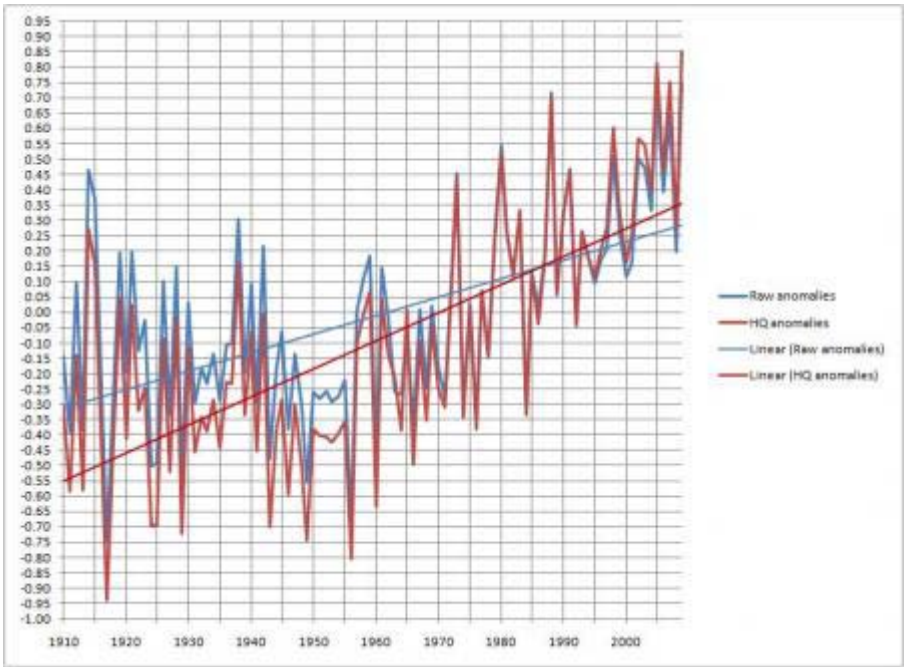


That's 0.6 degrees C / 100 years for the raw data. The adjusted trend is 0.85.

Before anyone complains that anomalies give you a more accurate picture of trends across a large region, I also calculated anomalies from the 1961-1990 mean for the all Australian means (0.6 raw to 0.85 HQ increase).



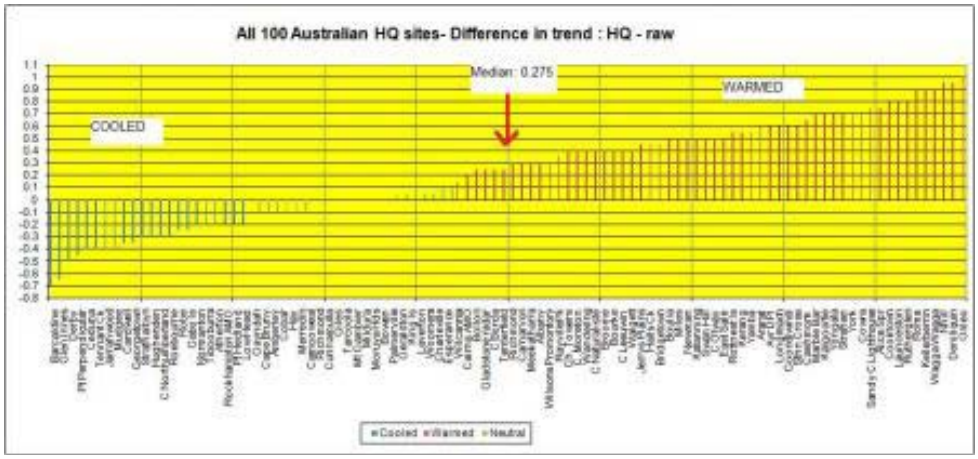
and for all 100 stations (slightly different result): (0.6 raw to 0.9- 50%)



But the figure BOM publishes is 1.0C- that's a two-thirds increase!

We can also look at the average adjustment for each station: + 0.23 degrees Celsius. (The table of all 100 stations is too large to include).

Or we can find the median adjustment (+ 0.275 C), and the range of adjustments:



So much for "*these tend to be equally positive and negative across the network*".

We can also look at the "quality" of the High Quality stations.

URBAN VS NON-URBAN:

"*Please note: Stations classified as urban are excluded from the Australian annual temperature timeseries and trend map analyses. Urban stations have some urban influence during part or all of their record.*" (http://www.bom.gov.au/cgi-bin/climate/hqsites/site_networks.cgi?variable=meanT&period=annual&state=aus)

In Part 1 I showed how 3 Queensland sites listed as urban by Torok and Nicholls (1996) are now non-urban. Della-Marta et al resurrected a number of others in other states.

The full list is: Cairns AMO, Rockhampton AMO, Gladstone MO, Port Hedland AMO, Roebourne, Geraldton AMO, Albany AMO, Alice Springs AMO, Strathalbyn, Mount Gambier AMO, Richmond AMO, Mildura AMO, East Sale AMO, Cashmore Airport, Launceston Airport.

15% of the network is comprised of sites that BOM is at pains to assure us are not used to create the climate record.

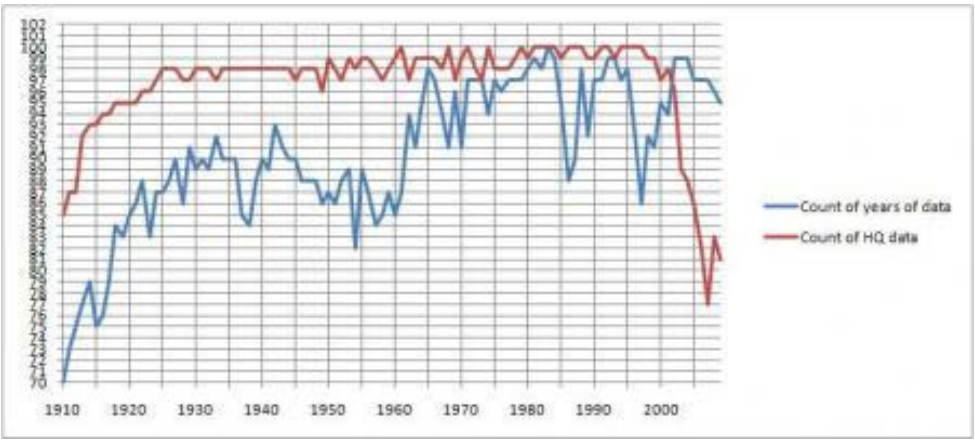
LONG RECORDS:

"*… the number of stations is much smaller if only stations currently operating and with at least 80 years of data are considered. To increase the number of long- term stations available, previously unused data were digitised and a number of stations were combined to create composite records… all stations in the dataset (were) open by 1915.*" (Torok and Nicholls)

Torok wanted 80 years of data: Della-Marta et al and BOM have settled for much less. There are six stations with no data before 1930 (80 years ago), but BOM has included these. Some are truly dreadful: Woomera- 1950; Giles- 1957; Newman- 1966.

As well, many of the sites have large slabs of data missing, with the HQ record showing "estimates" to fill in the missing years.

Here is a graph of the number of stations with data available for each year.



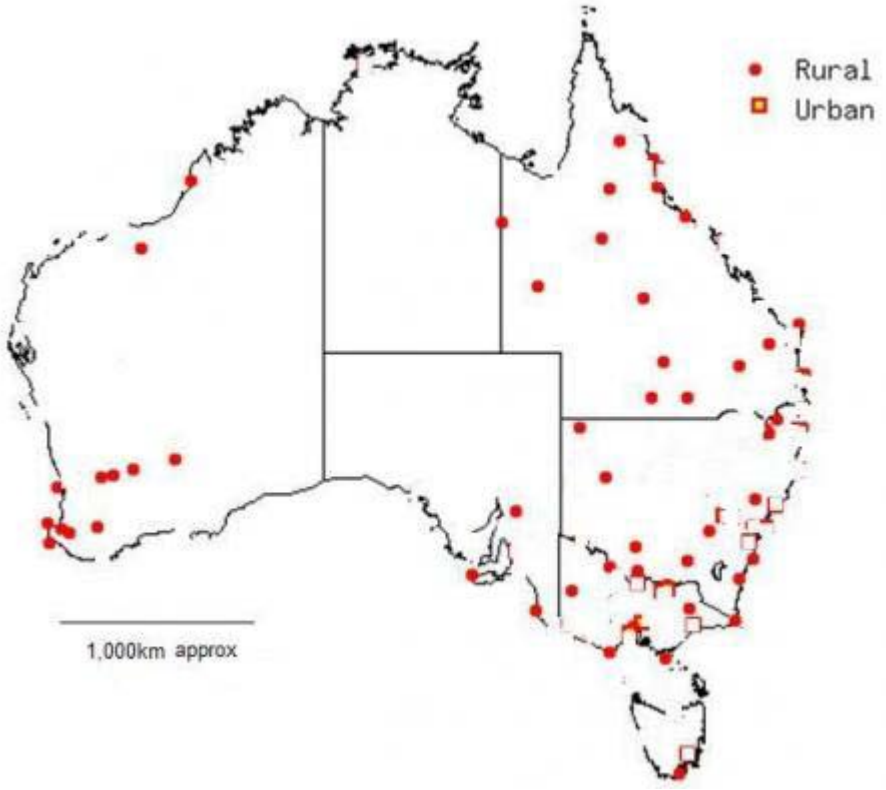
Note that only 70% of raw data is available for 1910; 90% by 1930; another drop from 1945 to 1960; and the huge drop off in HQ data this decade!

DATA COMPARISON:

"Generally, comparison observations for longer than five years were found to provide excellent comparison statistics between the old and new sites…… Comparisons longer than two years, and sometimes between one and two years, were also found to be useful if complete and of good quality… Poor quality comparisons lasting less than two years were generally found to be of limited use." (Della-Marta et al, 2004)

Wouldn't "excellent comparison statistics" be essential for such an important purpose? Apparently not. There are many sites with less than five years of overlapping data from nearby stations (up to 20 km apart). A number of sites have no overlap at all.

This results in enormous gaps in the temperature record. Here is the map of the High Quality network, with sites deleted if they are (a) listed as urban in 1996 (b) sites with less than 80 years of observations (c) sites with less than 5 years of comparative data overlap- or sometimes all of the above!



The sites left are concentrated in Eastern and South-Western Australia, with an enormous gap in the centre. Check the (admittedly very approximate) scale.

And finally…

CLAIMS MADE IN THE STATE OF THE CLIMATE REPORT PRODUCED BY BOM AND CSIRO IN MARCH 2010.

Since 1960 the mean temperature in Australia has increased by about 0.7 °C . The long term trend in temperature is clear…

TRUE. But the raw data shows the mean temperature since 1910 has increased only 0.6 C.

Australian average temperatures are projected to rise by 0.6 to 1.5 °C by 2030.

REALLY? That would require between 5 and 12 times the rate of warming seen in the raw temperature record, or between 3 and 7.5 times that shown by BOM's published figures.

Much of Australia will be drier in coming decades

MAYBE NOT. See http://kenskingdom.wordpress.com/2010/03/20/political-science-101/.

Our observations clearly demonstrate that climate change is real.

TRUE- that's what climate does.

CSIRO and the Bureau of Meteorology will continue to provide observations and research so that Australia's responses are underpinned by science of the highest quality.

"Highest quality"? REALLY?

CONCLUSION

This study shows a number of problems with the Australian High Quality Temperature Sites network, on which the official temperature analyses are based. Problems with the High Quality data include:

- It has been subjectively and manually adjusted.
- The methodology used is not uniformly followed, or else is not as described.
- Urban sites, sites with poor comparative data, and sites with short records have been included.
- Large quantities of data are not available, and have been filled in with estimates.
- The adjustments are not equally positive and negative, and have produced a major impact on the Australian temperature record.
- The adjustments produce a trend in mean temperatures that is roughly a quarter of a degree Celsius greater than the raw data does.
- The warming bias in the temperature trend is 41.67%, and in the anomaly trend is 50%.
- The trend published by BOM is 66.67% greater than that of the raw data.

The High Quality data does NOT give an accurate record of Australian temperatures over the last 100 years.

BOM has produced a climate record that can only be described as a guess.

The best we can say about Australian temperature trends over the last 100 years is "Temperatures have gone down and up where we have good enough records, but we don't know enough."

If Anthropogenic Global Warming is so certain, why the need to exaggerate?

It is most urgent and important that we have a full scientific investigation, completely independent of BOM, CSIRO, or the Department of Climate Change, into the official climate record of Australia.

I will ask Dr Jones for his response.

(Thanks to Lance for assistance with downloading data, and janama for his NSW work. Also Jo Nova for her encouragement.)

Source: http://wattsupwiththat.com/2010/07/27/the-australian-temperature-record-the-big-picture/.

Cover art from anbg.gov.au.