

## **What Rutherglen tells us about World's Best Practice, and the Australian Bureau of Meteorology**

### 1. Introduction

Central to the politics, economics and morality of anthropogenic global warming is the idea that temperatures have risen dramatically over the last 100 years because of emissions of carbon dioxide and other greenhouse gases from industrialization. This information is often presented as a scientific fact. In reality, the methods used by climate scientists across the English-speaking world in the construction of these charts, which show run-away global warming, includes an awful lot of creative accounting, and more.

Some of the creative accounting happens when temperature time series are homogenised. The Bureau of Meteorology claims this must be done to correct for *discontinuities* created when there is a site move or equipment change, and to remove systematic errors or artefacts in the raw data. This assumes that there are basic quality control issues with the data, for example transcription and other errors.

This evening, with the few minutes that I have, I will show you some raw temperature data for Rutherglen, and also for the nearby location of Beechworth, also in north east Victoria. I've chosen Rutherglen not because it is unique, but because it is the example that seems to have been remembered from the series of articles in *The Australian* newspaper written by Graham Lloyd last year.

I have applied a simple technique to the minimum temperature series from Rutherglen and Beechworth, from which it will become evident that there are discontinuities in the temperature series from Beechworth, but *not* Rutherglen. There is also a documented site move corresponding with the discontinuity at Beechworth.

The raw temperature series from Rutherglen, however, is almost perfect from a data perspective. That is, it shows no discontinuities, and there are no documented site moves or equipment changes, no outliers or other artefacts that might need to be removed as part of a proper quality control process.

For some, however, there is a major problem with the temperatures as measured at Rutherglen. An inconvenient truth: the temperatures as measured at this agricultural research station since November 1912 don't show global warming.

Of course, it is possible to change the trend in any time series by making specific adjustments to individual values, and then propagated these backwards. This technique is applied to Rutherglen, and the other 103 temperature time series used to construct the contrived official national temperature series for Australia. The adjustments have the effect of cooling the past, thus making the present appear hotter.

### 2. Raw Minima Temperatures for Rutherglen and Beechworth

Control charts are routinely used to monitor data quality, not within climate science, but within many other disciplines that analyse time series data. The technique does have much potential application to climate

science, and I've used control charts to find discontinuities, and correct the same, in temperature series from Cape Otway lighthouse, as published in the most recent volume of the international climate science journal *Atmospheric Research* (volume 166, pages 141-149). The information I will present here is drawn from a paper currently under peer-review entitled 'Quantifying uncertainty in measured and homogenized minimum temperature time series from Rutherglen, Australia (1913 to 2014)'. I'm happy to email the entire manuscript to those genuinely interested in more detail.

The Bureau of Meteorology does *not* use control charts to find, or correct, discontinuities. Rather it uses a technique that relies on 'comparative stations', and unique algorithms, which are not available for public scrutiny. Until the series of articles by Graham Lloyd the list of 'comparative stations' was not publically available. A list was published in August 2014, following requests from Lloyd. One of the comparative stations that the Bureau lists, as used to 'correct' the temperature series at Rutherglen, is Beechworth.

Rutherglen	82039	Min	01/01/1974	Statistical*	-0.57	74034	82053	82002	72097	82100	74114
Rutherglen	82039	Min	01/01/1966	Statistical*	-0.63	82053	82002	82001	72150	74114	80011
Rutherglen	82039	Max	01/01/1950	Statistical*	0.63	82053	72023	82001	82002	75028	75028
Rutherglen	82039	Max	01/01/1938	Statistical	-0.59	82053	72023	82001	82002	75028	75028
Rutherglen	82039	Min	01/01/1928	Statistical	-0.49	82053	82002	72023	82001	75028	74034

Figure 1. Extract from 'ACORN-SAT Station Adjustment summary' showing the temperatures adjusted (third column), date from which all adjustments are applied (fourth column), and 'surrounding' stations used for statistical comparison (columns 8-17). Minima and maxima temperatures are recorded, and from these a mean is calculated. 82001 is the Bureau's station number for Beechworth.

Beechworth is approximately 40kms south east of Rutherglen. There is a minimum and maximum temperature series for this location from January 1908 until June 1986. When monthly minima are run through a control chart we see that there is a step-change, a discontinuity, in 1977, Figure 2.

This corresponds with a documented site move for Beechworth, recorded as occurring in 1977. This change appears to have caused a step-down in the annual minima from 1977 (top chart), and a corresponding exceedance of the upper control limit for the moving range (middle chart). It would be appropriate to make adjustments/homogenize the temperature series to account for this discontinuity associated with a real physical cause.

When the equivalent series for Rutherglen is run through a control chart, Figure 3, we see that the mean annual minimum temperature (top chart) fluctuates within three standard deviations (defined by the upper and lower red lines) from the overall mean. The moving range of the subgroup mean (middle chart), and the sample standard deviation (bottom chart) are also generally in control for the period of the record. This suggests that *if* there had been any site moves or equipment changes they have *not* significantly perturbed the historical record.

Following the series of articles in *The Australian*, the Bureau claimed in August 2014 that there had been a site move at Rutherglen. Pages of documentation were provided, but none provided actual evidence for a site move. In the official Bureau ACORN-SAT catalogue published in 2012, it clearly states, in accordance with the available metadata, that there has *never* been a site move at Rutherglen, Figure 4.

In summary, the Bureau uses a 'comparative station', Beechworth, with obvious discontinuities in its record, to 'correct' the temperature record at Rutherglen. Yet applying standard statistical techniques it would

appear there is no need to apply any such ‘quality control’ to Rutherglen. Careful scrutiny of the official historical record for Australia, and homogenization techniques as routinely applied by other such institutions in the UK and the USA, would suggest that such statistical *nonsense* is routinely justified as ‘World’s Best Practice’.

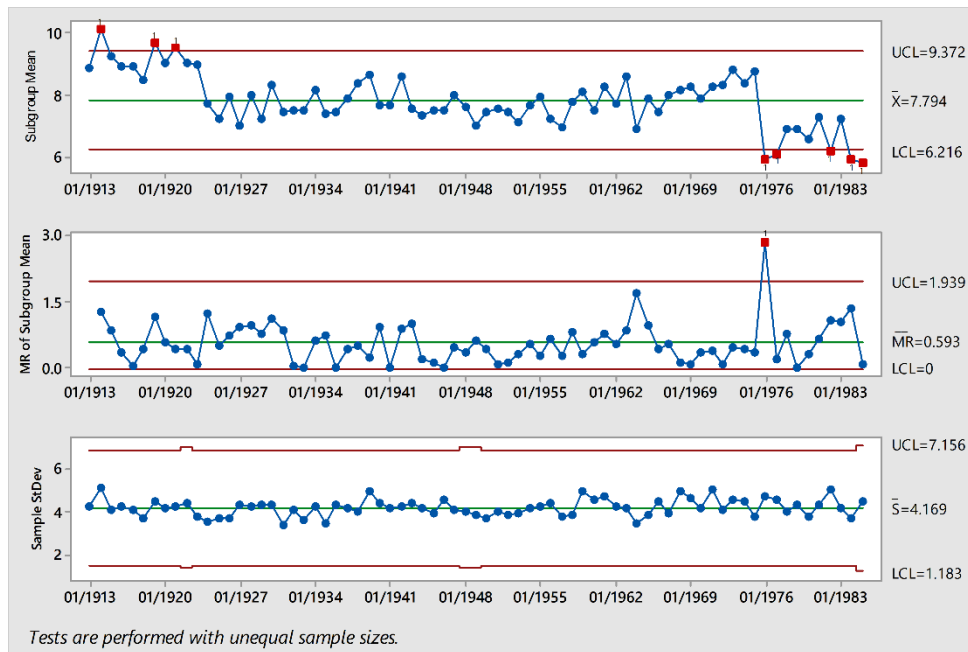


Figure 2. I-MR-R/S control chart showing measured raw minimum temperatures as recorded at Beechworth (1913-1985). Top chart shows the annual mean minimum temperatures for Beechworth, middle chart shows the moving range of the subgroup (annual) mean, bottom chart shows the standard deviation of the subgroup mean.

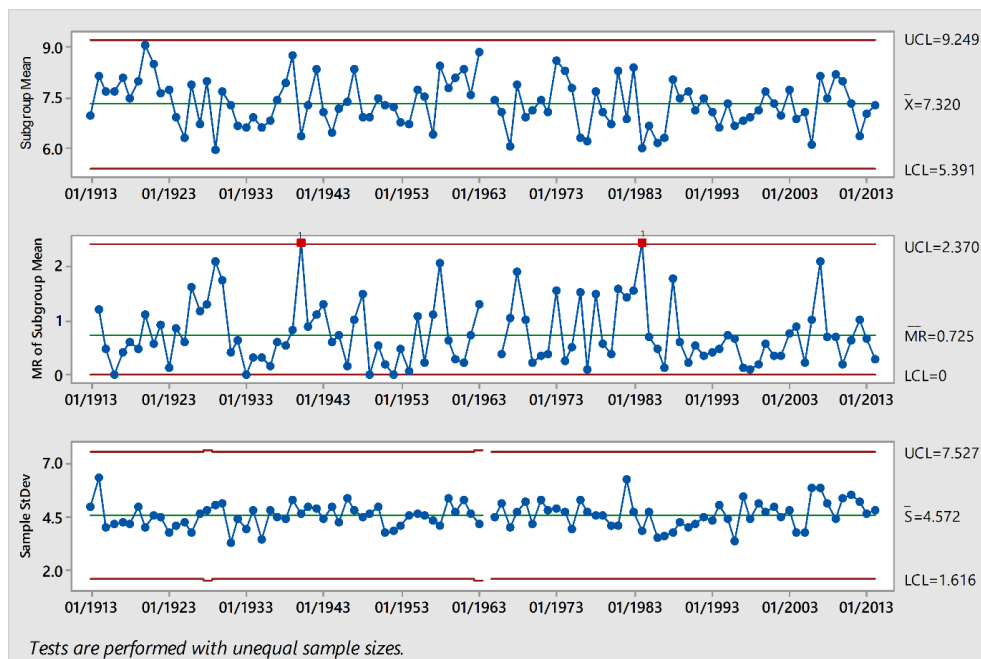
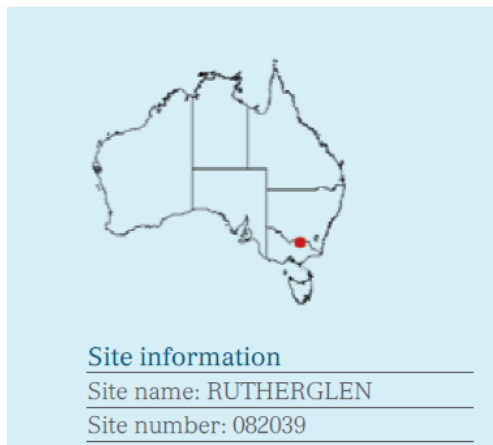


Figure 3. I-MR-R/S control chart showing measured raw minimum temperatures as recorded at Rutherglen (1913 - 2014).

## Rutherglen



### Rutherglen (082039)

This site is an automatic weather station located on the grounds of a research farm, about 7 km southeast of Rutherglen and well outside the town area, on flat ground over grass (farm paddocks) but with low hills a few hundred metres to the north. A gravel road (carrying farm traffic only) is a few metres to the west of the site.

### History

There have been no documented site moves during the site's history. The automatic weather station began operations on 29 January 1998.

Figure 4. The official catalogue, published by the Bureau in 2012, clearly states there have been no sites moves at Rutherglen.

### 3. Summary, Warming Trend Created by Cooling the Past

Even though all temperatures were recorded in a Stevenson screen, there are *no* documented site moves (Figure 4), and *no* discontinuities (Figure 3), the Bureau nevertheless makes changes to the minimum temperature series as recorded at the Rutherglen Research Station.

The extent of the changes depends on which Bureau document is consulted. The Bureau does *not* publish important methodological information in the peer-reviewed literature, and so it can make changes at whim, apparently without consequence.

The official summary as published in August 2014 (Figure 1) indicates that three ‘adjustments’ are made to the minimum temperature series for Rutherglen cooling the past by a total of 1.69 degree Celsius.

**This has the effect of changing a slight cooling trend of 0.35 degree Celsius per century in the raw data for Rutherglen, into dramatic global warming of 1.73 degree Celsius per century in the official record.**

The adjustments for Rutherglen as now published at the Bureau website\* omit the drop-down in all temperatures prior to 1928, which had the effect of artificially cooling all temperatures prior to 1928 by 0.49 degrees. Net cooling based on the adjustments as now published online indicate statistically significant ( $p < 0.5$ ) warming of 1.59°C per century for Rutherglen.

### 4. In Conclusion

The Bureau’s treatment of the data from Rutherglen is an example of what Ansley Kellow, Professor and Head, School of Government, University of Tasmania, would label ‘noble cause corruption’. The phenomena is detailed in his book entitled *Science and Public Policy: The Virtuous Corruption of Virtual Environmental Science* (Edward Elgar, Cheltenham, UK, 2007). In particular, Professor Kellow shows how

a reliance on mathematical models, and the infusion of values, have produced a preference for virtual over observational data in many scientific disciplines including climate science.

Many of the specific issues raised here were documented in the series of article by Graham Lloyd published in *The Australian* newspaper last year. Yet Environment Minister Greg Hunt was able to “kill” the idea of a proper review of methods used by the Bureau, apparently in order to protect the reputation of this institution. Mr Hunt was no doubt also fearful that a proper enquiry could show that there has been *some* exaggeration of the global warming trend. In reality, when we scrutinize the actual temperature measurements for many location across Australia, we find there is *no* warming trend what-so-ever.

This may be difficult to believe, but it’s true. Of course, public policy in secular democracies should be based on evidence, not wishful thinking, or remodelled temperature series – regardless of the consequences.

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\*ACORN-SAT station adjustment summary – Rutherglen (as at 24 September 2014)

<http://www.bom.gov.au/climate/change/acorn-sat/documents/station-adjustment-summary-Rutherglen.pdf>

Accessed 16th October 2015