

How to become a citizen climate sleuth

September 4 2014, by Neville Nicholls



There are hundreds of temperature observations to choose from across Australia.
Credit: Bureau of Meteorology

There has been much [media commentary](#) recently about the Bureau of Meteorology's efforts to use historical weather records to gauge how Australia's climate is changing.

Climate scientists have rejected claims that the Bureau has fudged data to show the world is warming. And the original observations have not been "corrupted" nor "deleted" nor "destroyed". They are all freely available on the [Bureau's web site](#).

But you don't need to rely on me or my colleagues or media commentators to tell you how the climate is changing. So much weather and [climate data](#) is now available that we can all be "citizen climate scientists".

The problem with climate data

The underlying problem for anyone trying to use weather observations to determine long-term climate changes is that changes in the exposure, location, observing practises, and even the instrumentation used for collecting these weather data have introduced biases into the data.

A quarter of a century ago, I initiated and led work within the Bureau to develop credible long-term records of Australian rainfall and [temperature](#) by calculating the effect of these various biases.

One reason we initiated this work was to make data more available to researchers and others. At the time it was difficult and expensive for people outside the Bureau to obtain historical climate data, and we were determined to overcome this.

Open data

In the first paper [we published](#) (in 1996) detailing the bias corrections, we made the original and adjusted temperature data available for 224 stations available on request.

This transparency and openness has since characterised the Bureau's approach to this real problem of how to account for biases in the original data—but still to make sure the original data were available, so that others could check what we were doing, and improve on it.

Much of the work that has been done in the Bureau and elsewhere to identify biases in the historical record has been documented in peer-reviewed papers in scientific journals.

And there are certainly traps for the unwary in looking at the raw, historical records.



This shows the thermometer screens at the Adelaide Observatory in 1888. Charles Todd established a very long experiment (it ran well into the 20th century) to compare temperature observations in the three different exposures illustrated here. His data show that the summer daytime temperatures measured in the typical 19th century thermometer exposure, the open stand shown on the right, were biased warm compared with the typical 20th century exposure in the

Stevenson Screen shown on the left. So simply comparing the raw data from the 19th century with data from the 20th century would be misleading. Author provided

But I'm convinced that, with a bit of effort and a few simple tools such as a spreadsheet program, anyone can now do what we started to do many years ago—compare how temperatures have changed over the past century or more, but taking into account possible biases caused by changes in instrumentation and location of stations.

Where to start

Why not start by looking at your favourite town somewhere in Australia? You can search for the original ("uncorrupted") data from a station close by your chosen town at the Bureau's [climate data centre](#). It is easy to put these data into a spreadsheet and plot them out to see how the climate at that location may appear to have changed over the years.

You might well notice some strange things happening, such as a sudden jump in temperature.

The next step is to compare that part of your favourite station's record with other stations nearby, to see if all the stations in a region show the same jump at the same time. You can do this [here](#) by looking at the nearby stations to which you would have been alerted when you searched for your favourite town (what I will call your "target station").

If this "jump" isn't widespread then you might conclude that the jump at the target station could be artificial, perhaps caused by the observing location shifting slightly or because a new building has been erected nearby.

Or perhaps the data at your [target station](#) show a sudden change in the relationship between minimum and maximum temperatures, suggesting that the way the thermometers are housed may have changed. This happened at many Australian stations about the start of the 20th century, when the use of the Stevenson Screen to house thermometers started to become the standard.

Another feature that might cause you concern about the data is a gap in the available data. This might suggest a change in observer or that the station itself has moved.

These are the sort of things the Bureau looks at to identify possible problems and biases in the historical, original data (although they use more sophisticated statistical methods, along with metadata about the location and other aspects of the station, to do this).

These sort of checks have led to the latest version of the temperature data, known as ACORN, where the Bureau has used sophisticated techniques to correct for these various biases and problems. These data are available [here](#).

Check other sources

But perhaps you are reluctant to rely on the Bureau's work. Many other organisations have taken the Bureau's original, unadjusted data and used their own techniques to prepare long-term records of surface temperatures with the biases removed, including the analysis from the University of New South Wales recently covered on The Conversation.

There are many other groups who have done their own analysis of global temperatures, including the Australian data: [Climate Explorer](#) and the independent group Berkeley Earth [Berkeley Earth](#). It's worth looking at their results too.

If you find a large discrepancy or bias when you were looking at your "target" station, then you might look at what other groups have done with the data at that station. [Berkeley Earth](#) provides the data for many thousands of locations, including Australian towns and cities, after the removal of such biases.

But perhaps you are suspicious of all temperature data collected at the surface of the Earth—in fact so are meteorologists like me, because we know that the original data have [biases](#) that we have to take into account in developing a credible temperature record.

You can also find trends in temperatures of the lower atmosphere estimated by satellites (only available since 1979) through Climate Explorer.

So you could look at those data and check if they show the same trends since 1979 as the surface [temperature data](#) prepared by other organisations. All of this is possible, and quite simple to do.

The data are all out there and freely available. So, with some simple tools you can use all these data to check for yourself how the global (or the Australian) [climate](#) is changing. Organisations such as the Bureau of Meteorology make their [data](#) available just so you can do this. Go for it!

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