

SOUND MANAGEMENT OF METEOROLOGICAL DATA

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The arguments in defence of adjustments to the surface temperature data fail to address the key issues with homogenization procedures in the Australian Climate Observations Reference Network - Surface Air Temperature (ACORN-SAT) as they are implemented by the Australian Bureau of Meteorology. While many have rushed to defend the BoM saying the adjustments “don’t matter” as they do not change the global temperature graphs appreciably, they clearly do matter to a lot of people. Here are the main reasons the current homogenization practises are unsound even if the impact on global averages is small.

1. Non-local side-effects

Baseline adjustments are in a different category to correcting outliers caused by transcription errors and so on, and should not be confused with legitimate data-hygiene. Currently step changes in temperature due to station moves are propagated backwards in time in order to maintain the match between current ACORN-SAT and the measured temperature. Back propagation changes all the past records thus divorcing past records from reality.

Back propagation produces absurdities. A monthly mean value in ACORN-SAT may exceed any raw temperature in the month. Zero degrees Celsius could be as much as two degrees above or below freezing point. Temperatures clearly recorded clearly on a meteorological datasheet contradict the homogenized record.

Moreover, record temperatures become meaningless. The Australian record high temperature in Oodnadatta of 50.7 degree C recorded on the 2nd of January 1960 may no longer be a record after moving any other station in the network. In computer programming this is called a non-localized side-effect and is the primary cause of software failures.

2. Historic revisionism

Every portrayal of historical data should be historically accurate, else it becomes revisionism, and strays out of the domain of science and into the domain of ideology and politics. While step-wise adjustments are intended to compensate for real changes in the baseline temperature that result from, often undocumented, changes in instrumentation or relocation of stations, the cumulative effect of back-propagating step adjustments is to corrupt the official record.

3. Potential to introduce bias

The adjustments potentially introduce bias. A review of the previous incarnation of an Australian temperature reference network called the High Quality Network by Ken Stewart and I showed a 31% exaggeration in last century's temperature trend [1]. There is a growing peer-reviewed literature showing that post-processing does bias substantial geographic regions. A re-evaluation of the mountain climate station network in the western United States decreased the trend from +1.16°C per decade to +0.106°C per decade and longer-term widely used gridded climate products amplified western U.S. elevation-dependent warming by +217 to +562% [2]. A rigorous reassessment of New Zealand century-long climatology produced a trend of 0.28 °C per century instead of the official 0.91 °C per century [3]. The propensity to bias is reason for caution in adjusting historic data.

4. Acting *ultra vires*

The Bureau of Meteorology Act 1995 empowers the BoM to provide meteorological *information* - dictionary defined as “... facts provided or learned about something.” As shown above, homogenized datasets with backward propagation of adjustments are not factual. A sporting analogy may be helpful. Imagine if a mythical Bureau of Sport were to propose to adjust Sir Donald Bradman’s batting average in test cricket down from 99.94 to 75 due, for the sake of the argument, to the change in the number of balls in an over from 8 to 6. Imagine if the BoS then claimed another batsman had exceeded the Don’s record. Clearly the arguments that the adjustment ‘don’t matter’ because they do not affect the global batting averages, and “As many batting averages have been adjusted up as

down, and our critics are cherry-picking a few isolated records”, are a lame defence, as is the argument that “no data is being destroyed, all of the original records are available on the BoS website.”

These are my suggestions:

1. Continue the provision of all data and metadata in format enabling reconstruction of ACORN-SAT that has only just been started with the belated publication of the ‘adjustments.xls’ file.
2. Consider localising adjustments by propagating them forward leaving historic values unchanged except in the case of documented errors. This will lead to divergence of present readings from ACORN-SAT, but in doing so accurately reflect the limitations of the network.
3. Start a concerted program of digitization of all of the historic meteorological records. This will increase the number of long-term data series requiring minimal changes.
4. Start calling research products what they are -- research. The High Quality Network was not "high quality" as shown in our study [1] and vindicated by the abrupt replacement with an entirely new network of stations -- the Australian Climate Observations Reference Network (ACORN).
5. As above, the ACORN network is not a network of "climate observations" as the adjustments divorce the data from real world observations.
6. Enable free open SQL access to a current copy of the entire BOM database for audit purposes.
7. Develop improved detection and correction methods utilizing the raw daily data and not aggregated monthly or annual data as in [4].
8. Use consistent formatting standards across meteorological datasets, including time date formats, column order and headers, such as POSIXct standards for time stamps.

REFERENCES

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ABOUT

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