Is homogenisation of Australian temperature data any good?

Part 5. Cooking-up data at Potshot

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The ACORN-SAT project is deeply flawed, unscientific and should be abandoned.

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Summary

With the fall of Singapore, the Philippines and the Dutch East Indies, Potshot was a top-secret long-shot – a WWII collaboration between the Australian and United States Navy and the Royal Australian Air Force. The aim was to deter invasion along the north-west coast of Western Australia and take the fight to the home islands of Japan. Potshot was also the staging point for the 27- to 33-hour *Double-Sunrise* Catalina flying-boat flights to Ceylon (now Sri Lanka) that were vital to maintaining contact with London during the dark years of WWII.

Stationed in Exmouth Gulf, Western Australia, USS Pelias provided sustainment to US submarines operating in Asian waters, and to provide protection, the RAAF constructed No. 76 OBU (Operational Base Unit) at Potshot in 1944. At the conclusion of hostilities, OBU Potshot became RAAF Base Learmouth, a 'bare-base' that can be activated on short-notice. Meteorological observations at the met-office commenced in 1975 and Learmouth is one of 112 ACORN-SAT sites (Australian Climate Observations Reference Network – Surface Air Temperature) used to monitor Australia's warming. Importantly, it is one of only three sites where data has not been homogenised by ACORN-SAT.

- By not adjusting for the highly significant Tmax step-change in 2002, ACORN-SAT failed its primary objective which is to "*produce a dataset which is more homogeneous for extremes as well as for means*".
- Cool air does not rise and the much-reduced size of 60-litre Stevenson screens are especially sensitive to warm eddies arising from surfaces, buildings etc. that are not representative of the airmass being measured, and which increase numbers of daily observations/year ≥95th day-of-year dataset percentiles at the expense of those ≤5th day-of-year percentiles.
- Use of statistical methods that rely on comparisons with data that are not homogeneous, and which failed to detect the prominent 2002 change-point in Learmouth Tmax, are fatal flaws in methods used by ACORN-SAT.

Use of faulty data to adjust faults in ACORN-SAT data has no statistical or scientific merit and as ACORN-SAT produces trends and changes in homogenised data that do not reflect the true climate, the project and its peers including others run under the guise of the WMO, should be abandoned.

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[1] Former NSW Department of Natural Resources research scientist and weather observer.

1. Introduction

The question is, whether data for Learmonth is homogeneous, and whether they are fit for the purpose of determining trend and change in the climate.

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Having survived the devastating raid on Pearl Harbour on 7 December 1941 and with enemy forces sweeping through Asia, in May 1943 the submarine tender USS Pelias in company with several warships sailed from Freemantle Western Australia to Exmouth Gulf (Latitude -22^{o}, Longitude 144^{o}) to play a central role in Operation Potshot (Figure 1).

Potshot aimed to take the fight to the Imperial Japanese Navy and deter enemy forces from invading northern WA, which in 1942/43 was of major concern. Potshot was also a long-shot and for its role, USS Pelias was to provide sustainment for Allied submarines operating around northern Australia and following their surrender on 8 March 1942, the former Dutch East Indies, and as far west as Singapore and the home islands of Japan. At that time, with significant numbers of Australian army units, Royal Australian Air Force (RAAF) personnel and Royal Australian Navy (RAN) ships committed to resisting Hitler's march through Europe and the Middle East and having a vast exposed north-western shoreline to defend, Australia was relatively vulnerable.

Figure 1. The submarine tender USS Pelias at a base on the US West Coast, provided sustainment for US submarines operating in northern Australian waters after May 1943 as part of Operation Potshot (AWM photograph 302645).

Earlier, on 26 March 1943, in addition to an already approved £50,000 operational base (OB) inland at Yanrey Station, the Minister for Air (Arthur Drakeford) approved a recommendation from the Air Board for consideration by the War Cabinet for two hard-surface runways, adequate dispersal facilities, buildings and engineering services for a Fighter Squadron to be based at Potshot. Costing £108,600, the base known as No. 76 OBU (Operational Base Unit) was funded as an Australian-American project under the reciprocal Lend-Lease agreement.

While OBU Potshot was envisaged as a fighter base, works at Yanrey were to be completed to accommodate a dive-bomber squadron. The purpose of the bases was to provide protection for USN submarine operations and also for the Catalina base that was part of the "Double Sunrise" service between Freemantle and Ceylon (now Sri Lanka) ostensibly a civilian operation run by Qantas, which was a vital wartime link between Australia and London. Taking between 27 and 33 hours to make the 3,580 nautical mile (6,630 km) crossing, the advantage of Potshot was that it was 75 nautical miles closer to Ceylon than Carnarvon, a distance that may have mattered for an unarmed fully loaded, slow-flying Catalina flying-boat.

While it was necessary to stand down during the cyclone season, at its peak, there were 15, B25 Mitchell bombers (of 18 Squadron RAAF), eight Kittyhawk fighters of the No. 120 (Netherlands East Indies) Squadron (RAAF), and 11 Beaufighters of (31 Squadron RAAF) located there. In 1945, as Japanese forces withdrew from the Philippines and operation Potshot wound-up, the formerly heavily defended aerodrome transitioned to become RAAF Base Learmonth (Figure 2). Used also for civil aviation, Learmonth is one of three 'bare-bases' that the RAAF can speedily activate to operating status as required.

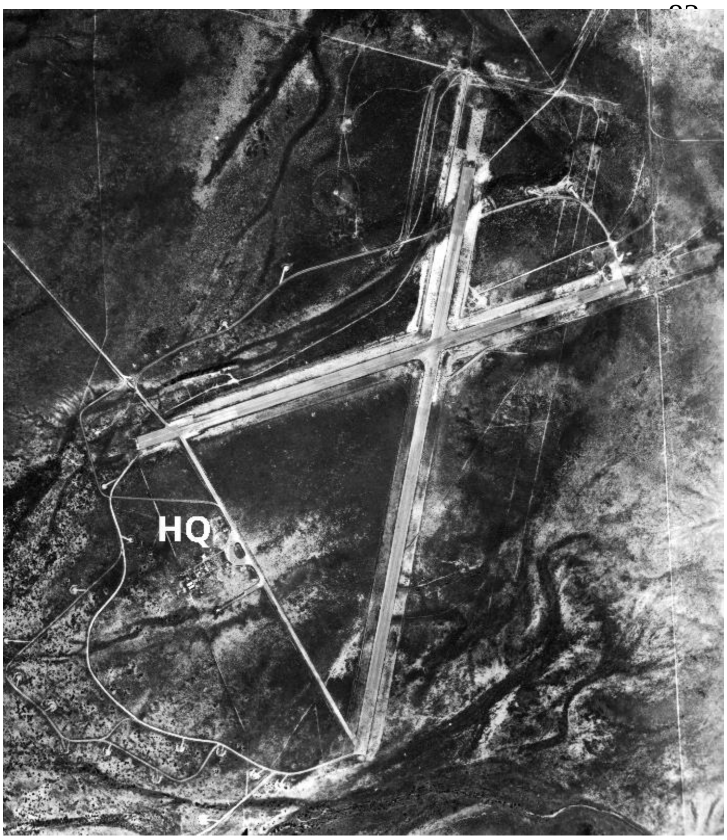

Figure 2. RAAF Base Learmonth in September 1949 showing dispersed, splinter-proof aircraft pens, and location of the apron and operations precinct (HQ).

While the RAAF Aeradio and met-section commenced operating at Learmonth in 1944 and patchy rainfall data are available from the Bureau of Meteorology (BoM, Site ID 05007), no maximum or minimum temperature data (Tmax and Tmin) are available before 1975 when a site was located at the meteorological office (MO) adjacent to the current airport entrance.

Learmonth is one of 112 ACORN-SAT sites (Australian Climate Observations Reference Network – Surface Air Temperature) used to monitor Australia's warming and importantly, one of only three sites where data has not been adjusted by homogenisation.

The question is, whether data for Learmonth is homogeneous and whether they are fit for the purpose of determining trend and change in the climate.

The ACORN-SAT catalogue states that while there have been no documented moves at the MO site, an automatic weather station (AWS) installed in a 60-litre Stevenson screen on 29 August 1994[1] became the primary instrument on 1 November 1996. However, the former 230-litre screen continued to be used until 19 September 2006. During that time, a Milos AWS operated from 18 December 1998 to 9 October 2001 (BoM ID 05092), but its role is unclear. Site-diagrams in site-summary metadata show two screens on 10 September 1999, one being labelled Milos, but only one on 17 August 1997 and 31 May 2000. Possibly setting the stage for data to be adjusted in the future, the most recent ACORN-SAT metadata stated that "*buildings associated with the Meteorological Office were removed in 2018 but no impact on the data is yet apparent*".

2. Methods

Methods used to analyse trend and change in temperature data must be transparent, rigorous, objective and replicable. BomWatch protocols were developed with those principles in mind.

Read on …

Methods used to analyse maximum temperature data (Tmax), including the underlying physical principles and links to freely available software and packages, were outlined in the Parafield case

[1] Australian Climate Observations Reference Network – Surface Air Temperature (ACORN-SAT): Observation practices (Table 5, p. 11); BoM, 2012.

study[1] and expanded-on subsequently in reports for Marble bar and Meekatharra. Collectively referred to as BomWatch protocols, the approach is objective, statistically robust, and replicable, which are the hallmarks of the scientific method.

For the information of *fact-checkers* at the ABC (Australian Broadcasting Corporation), *the Conversation* and *The Climate Council*, relationships between Tmax and Rainfall determined by linear regression, partitions variation due to rainfall from residual variation that is unexplained. If rainfall fully explains Tmax, residuals are expected to be homogeneous, independent, normally distributed with equal variance across their range. Having removed the rainfall effect, residuals are also tested for time-wise inhomogeneities that may indicate site change effects. The approach circumvents the problem that site changes occur in parallel with observations and therefore cannot be separated from the signal of interest using time-series techniques.

Utilising the R statistical framework, the *Rcmdr* and *emmeans* packages and the STARS Excel workbook, checks and balances include that:

- Tmax is expected to be significantly, negatively correlated with rainfall, and rainfall is expected to explain >50% of Tmax variation (R^2_{adj} >0.5). Rescaled for convenience by adding grand-mean Tmax, STARS is used to test that residuals are homogeneous.
- Data segments identified by STARS are examined individually for goodness of fit using naïve linear regression. Subset by category variables (1...n, where n is the number of segments) the pooled dataset is analysed using multiple linear regression (MLR) to verify:
    - That individual regressions are offset (not coincident) and parallel (interaction is not significant), indicating that segmented responses to rainfall (°C/100mm) are the same.
    - Rainfall-adjusted segment means estimated by *emmeans* (using *p*-level adjustments for multiple comparisons as necessary) are different and represent the 'true' site-change effects on Tmax (°C (SEM)).
- Confirming that data are discontinuous, *post* hoc analysis verifies that data each side of a step-change consist of un-trending (or equi-trending) segments, and also identifies potential outliers to the Tmax ~ rainfall case.
- Having accounted for rainfall and site-changes simultaneously, MLR residuals are examined for unaccounted-for trends that could be attributable to another factor such as CO_2, coal mining, and changes in the climate.

Suspected site changes are also investigated *post hoc* using BoM and ACORN-SAT metadata, supplemented by documents, aerial photographs and other resources held by the National Archives and National Library of Australia (NAA and NLA), museums, state agencies etc., and using satellite imagery provided by Google Earth Pro.

The advantage of BomWatch protocols over methods used by BoM scientists, most recently Blair Trewin, is that they cannot be fudged to create bogus trends, and they use well-known, objective, investigative statistical tools to resolve site change effects on data. Should cases arise where site changes cannot be reconciled with what is known about a site, rigorous statistical analysis combined with *post hoc* tests provide a high level of confidence that change occurred, and that it was unrelated to weather or climate.

In contrast, homogenisation methods used by BoM scientists are largely opaque, jargonistic and not easily replicated. Their use of linear correlations based on first differences and anomalies

[1] https://www.bomwatch.com.au/data-quality/part-1-methods-case-study-parafield-south-australia-2/

relative to 1961 to 1990 '*climate normals*' or other reference frame, during which time most sites changed or moved, are cases in point. BoM scientists also do not undertake *post hoc* tests to verify their methods are sound and that homogenised data truly reflect the climate.

3. Results

> The question is, whether data for Learmonth truly reflect the climate.
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> Read on …

For the benefit of *fact-checkers*, BoM scientists and climate modelers including UNSW mother, person, human being and heatwave expert Sarah Perkins-Kirkpatrick[1], Table 1 presents a detailed statistical summary of the main findings, which are shown graphically in Figure 3. Analysed using the same or similar protocols, the same data as annexed to this report, will arrive at the same statistical end-points shown in Table 1.

Rainfall reduces Tmax by 0.239°C/100mm (P = 0.003) but only explains 15.9% (R^2_{adj} = 0.159) of Tmax variation overall (Table 1, Case (i) and Figure 3(a)), which is considerably less than the benchmark value of 50% (0.50). Rescaled by adding grand-mean Tmax (31.9°C), residuals from that analysis analysed using STARS embed a step-change of 0.77°C in 2002, which, as the effect of rainfall has been removed, is attributable to site or instrument changes (Pr(>|t|) <0.001; Figure 3(b)).

Segment-by-segment analysis (Table 1 (ii)) show the relationship for data after 2001 stepped-up relative to rainfall and Tmax reference-lines in Figure 1(c) and (d). (Rainfall-adjusted segment means are shown in the top-right of Figure 3(c) and (d).) Factored as group variables, multiple linear regression (Table 1 (iii), Figure 3(e)) confirmed that relationships for individual segments were parallel (interaction was not significant). Indicated by superscripts, rainfall-adjusted segment means were different (individual regressions were not coincident) and that the difference (Delta) of 0.77°C (0.137_{SE}) was highly significant (P <0.0001). Calculated from residual sums of squares (RSS), $R^2_{partial}$ (= $RSS_{(rain)}$ - $RSS_{(Sh + rain)}$/ $RSS_{(rain)}$ * 100) the step-change accounted for 42.73% of variation not explained by the naïve (Table 1 (i)) Tmax ~ rainfall case, highlighting that the step-change variable is highly influential.

Table 1. Statistical summary referred to in the text.

Model	Coef. (°C/100mm)	P	R^2_{adj}	Segment	RainAdj (SE) (°C)	RSS ($R^2_{partial}$)	
(i) Tmax ~ rain	-0.239	0.003	0.159			16.41	
(ii) Tmax ~ rain							
1976-2001	-0.250	0.014	0.191				
2002-2022	-0.228	0.005	0.306				
(iii) Tmax ~ Sh_{res} + rain	-0.238	<0.001	0.500	1976-2001	31.6[(a)] (0.091)	9.53	Interaction
				2002-2022	32.4[(b)] (0.102)	(42.73)	Tmax ~ Sh_{res} * rain
				Delta	0.77 (0.137)		ns
(iv) Tmax ~ Year	(°C/decade)						
	0.237	<0.001	0.227	1976-2001			P = 0.54 (ns)
				2002-2022			P = 0.58 (ns)

[**Notes**: Case numbers are on the left; RainAdj refers to rainfall adjusted means (with standard errors) calculated by the *emmeans* package; RSS refers to residual sums of squares (residual variation not explained by the model in the first column); segment refers to data-segments defined by the step-change detected by STARS using sequential t-tests; ns indicates non-significance (P >0.05)].

[1] P. 17, in: https://www.bomwatch.com.au/wp-content/uploads/2023/01/Carnarvon_backstory_Jan_04.pdf

To close the case, *post hoc* analysis (Table 1 (iv)) confirms that while the naïve Tmax trend of 0.237°C/decade appears to be highly significant (P <0.001; R^2_{adj} = 0.227), data consist of two non-trending segments (P_{trend} >0.50) joined by the 2002 discontinuity. Although an influence plot identified 1994 and 2019 as outliers, multiple linear regression residuals were independent, normally distributed with equal variance across their range. As there was no residual trend due to CO_2 or anything else it could not be claimed that the climate has changed or warmed.

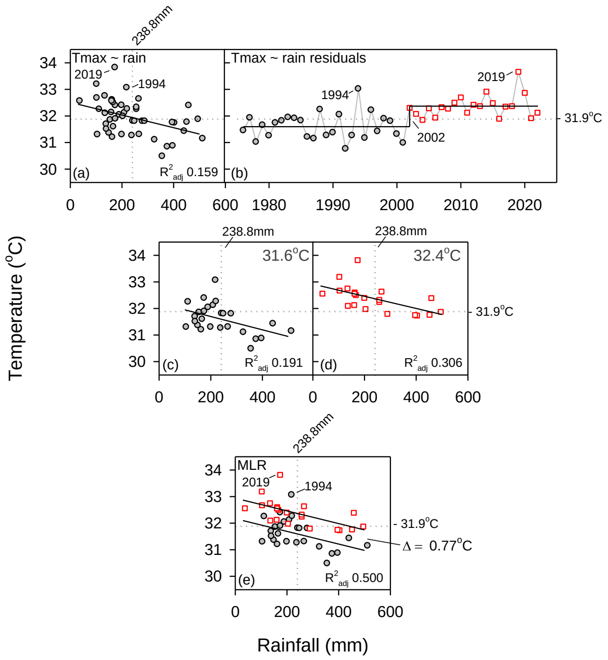

Figure 3. Graphical analysis of Learmonth Tmax (refer to Table 1).

3.1 Verification

> Verification that processes causing variation in Tmax were fully explained by the analysis, is as important as the analysis itself.
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Goodness of fit of alternative statistical models is compared graphically by plotting observed Tmax against data predicted (or fitted) by the respective Table 1(i) and Table 1(iii) statistical models. A 1:1 line would represent a perfect fit i.e., a situation when model predictions align perfectly with observations (Figure 4).

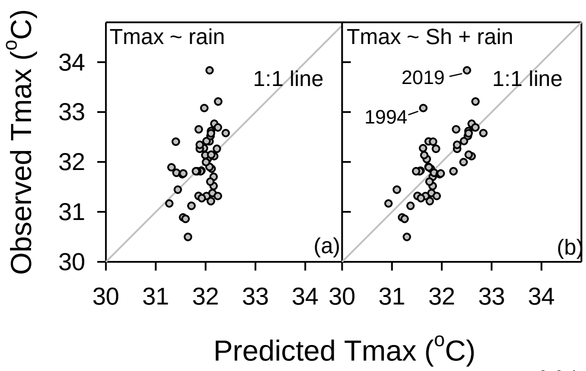

Figure 4. Values predicted by a perfectly fitting statistical model would align closely with those observed along a 1:1 line. As the Tmax ~ rainfall relationship (Table 1(i)) was only moderately significant and explained only 15.9% of Tmax variation, observed vs. predicted values are widely dispersed from the 1:1 line. However, inclusion of the step-change variable (Table 1(iii)) resulted in predictions falling closely along the 1:1 line with no apparent bias (b). The plot also highlights that data for 1994 and 2019 are considerably out-of-range.

3.2 Interim conclusions

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- As data comprise of two segments linked by a step-change which is most likely related to the transition from manual observations or the *Milos* AWS to the Almos AWS and the more sensitive 60-litre screen, data are not homogeneous. Naïve trend of 0.237°C/decade is therefore spurious and does not reflect the 'true' climate.
- Accounting for the step-change and rainfall simultaneously, leaves no residual trend attributable to CO_2 or anything else.

4. So, what happened in 2001/02?

> Metadata is unreliable. It is reasonable to conclude that the overlap from August 1994 to September 2006 was used to smooth the transition from the former 230-litre to the 60-litre screen, and introduction of the AWS.
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BoM metadata is misleading and deficient. The only mention of any change is that while its 60-litre replacement screen and AWS became operational on 29 August 1994, the 230-litre screen continued in service until 19 September 2006. Also, data for the *Milos* AWS (site ID 05092) commenced on 21 December 1998 and ceased on 9 October 2001. However, as noted previously, site-diagrams in site-summary metadata show the *Milos* was present only on 10 September 1999. In addition, although a small screen should have been operating in parallel, only a single large screen is shown by the site-plan for 17 August 1997. Also, no second screen or *Milos* AWS is shown by the plan for 31 May 2000, which, if ACORN-SAT agreed with site-summary metadata, would have shown three Stevenson screens in operation (230-litre, 60-litre and *Milos*).

In the light of the data (Table 1 and Figure 3) it is reasonable to conclude the various overlaps between AWS and Stevenson screens were used to smooth the transition from manually observed thermometers housed in the former 230-litre screen, to AWS and rapid-sampling temperature-probes housed in the 60-litre screen. As Tmax data are continuous, the step-change resulted from the adjustment process, which attempted to bridge the difference between the former and current instruments. While the role of the *Milos* AWS is obscure, the 2002 step-change lies near the mid-point of the 12-year period during which the screens and instruments were compared (1994 to 2006).

5. Effect of the AWS and 60-litre screen on Tmax extremes.

> The change in instruments and screen caused daily Tmax ≤5th day-of-year percentiles to decline and counts of daily values ≥95th day-of-year percentiles to increase abruptly after 2002.
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Extreme temperatures are those comprising the tails of daily data distributions, namely the number of values/yr ≤5th (Lo_N) and ≥95th (Hi_N) day-of-year dataset percentiles (Figure 5(a)). Their Hi_N/Lo_N ratio is expected to vary randomly and to be homogeneous in the long-term. Log_{10}-transformed so they are normally distributed (symmetrical about their mean) temporal changes detected by STARS are shown in Figure 5(b).

Average counts of low extremes per year (Lo_N) declined from 28.9 to 17.0 after 2002, while numbers of upper-range extremes (Hi_N) increased from 16.6 to 33.8, which resulted in the highly significant step-change in their log-transformed ratio. The non-significant change in 2019 was due to out-of-range data in 2019 and 2020 and was too near the end of the record to be a reliable indicator of future differences. It also cannot be ruled out that data for 2019 and 2020 were affected by demolishing the office in 2018.

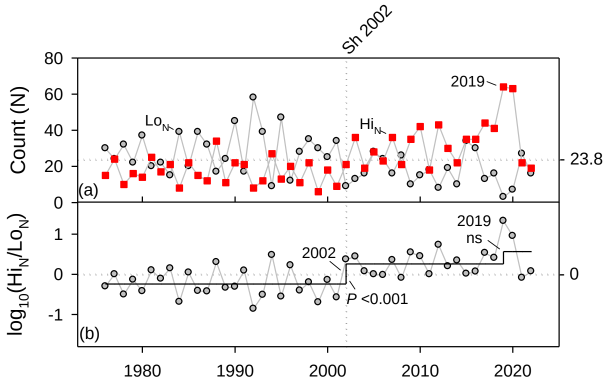

Figure 5. Counts/year of daily Tmax observations ≥95th and ≤5th day-of-year dataset percentiles (Hi and Lo respectively) (a) and their $\log_{10}$ ratio (b) analysed using STARS. The average across all counts is shown as a reference. Note that pending more data, the 2019 step-change in (b) may not be significant (*P* >0.05).

6. Discussion

> As Tmax data for Learmonth are affected by a step-change in 2002 due to the change from manually observed thermometers housed in 230-lite screens to the AWS operating with a 60-litre screen. As data are not homogeneous, trends in Tmax do not reflect the true climate. Something is wrong that the step-change was not detected by homogenization methods used by ACORN-SAT.
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> Read on …

Together with 10 apparently highly correlated neighbours, Tmax data for Learmonth were only used to adjust an alleged statistically-detected change in ACORN-SAT v.2 data for Wittenoom in 1993 (now Karijini North (ID 5098)) but not by ACORN-SATv.1. However, something is wrong. The same suite of ACORN-SAT v.2[1] statistical tests (HOMER v.2.6, MASH v,3.03 and RHTests v.4) failed to detect the Tmax step-change of 0.77°C at Learmonth in 2002. Despite claims to the contrary, Trewin's homogenisation methods are either fudgeable, fallible or not up to the task.

Possibilities include:

- That without undertaking statistical verification of their soundness, because they align with the narrative, Trewin and colleagues decided to accept the data as they are.
- That due to the quasi-synchronous introduction of 60-litre screens (and AWS) across regions[2], correlated reference series embed similar changepoints and therefore were incapable of discriminating between changes that happened at Learmonth and those embedded in reference series.
- That compared to STARS, HOMER v.2.6, MASH v,3.03 and RHTests v.4, all of which use comparative methods, have little skill in objectively detecting changepoints.

Even though not fully documented by metadata, failure to detect the changepoint that Trewin could reasonably be expected to know about, illustrates the fallacy of relying on faulty or incomplete metadata, use of statistical tests that rely on correlated reference series for changepoint detection, and using the same reference series for making homogenisation adjustments.

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[1] Trewin, Blair (2018). *The Australian Climate Observations Reference Network – Surface Air Temperature (ACORN-SAT) version 2*. Bureau Research Report No. 032. (http://www.bom.gov.au/climate/change/acorn-sat/documents/BRR-032.pdfRR-032 (bom.gov.au))

[2] E.g., Marble Bar, 2000; Carnarvon, 1997; Meekatharra, Halls Creek and Rabbit Flat, 1996

Use of guesswork and faulty reference series to adjust faults in ACORN-SAT data has no scientific or statistical merit and should be abandoned.

7. Implications

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According to his résumé, Blair Trewin, who developed ACORN-SAT is a member of the World Meteorological Organisation's (WMO) Expert Team on Climate Change Detection and Indices, and the scientific co-ordinator of WMO's annual Statement on the Status of the Global Climate in 2010 and 2011. It is a problem that if climate groups around the world are coordinated by WMO to use faulty homogenisation methods based on inter-site comparisons, they are highly likely to predict similar rates of warming.

As shown using data for Learmonth and other sites, and by his numerous publications, Trewin's approach to data homogenisation seems biased *a priori* by his beliefs about global warming. A methodology that would cause homogenised data to warm, would include:

- Use of incomplete and misleading metadata to characterise the likelihood of site-related impacts on data; and
- Use of reference series to detect changepoints and make adjustments, comprised of neighbouring sites that due to correlation of first differences with the target, likely embed parallel faults.

Manipulating trend is thus the simple product of making adjustments to changepoints that made no difference to the data and ignoring those that did, and using data that likely embed parallel faults, to make adjustments that are disproportionate to the size of the inhomogeneity.

While individual overlapping datasets are not available (but they must exist) the 2001 step-change in Learmonth Tmax was brushed-over by averaging or adjusting the two sets of data during the 12-years both screens were reportedly operating in parallel. Presuming data were treated the same as other ACOR-SAT sites, it is a major dilemma that the various statistical tests including HOMER v.2.6, MASH v.3.03 and RHTests v.4 that use reference series, were incapable of detecting the highly significant rainfall-adjusted step-change of 0.77°C which is more than double the adjustment criteria of 0.3°C listed on p. 7 of the aforementioned Trewin (2018). Trewin also noted on p. 19 that "*Unlike some other countries which changed their thermometer screen design at the same time as they introduced AWSs … Australia retained the same wooden Stevenson screen design used at manual stations*", which is not strictly true.

Although the change to AWS primarily related to a change of instrument, in many cases 60-litre screens were installed at the same, or around the same time manual observations were discontinued. All but two ACORN-SAT sites now operate AWS and while as of 2012, only five sites were equipped with 230-litre screens, as of 2023, most of those have probably been replaced. To confuse the issue further, the allegedly small Stevenson screen at Hobart Airport shown in Figure 4 in *Australian Climate Observations Reference Network – Surface Air Temperature (ACORN-SAT): Observation practices*, was at that time a large 230-litre screen (Figure 6).

At Learmouth the 60-litre screen was installed coincidently with the AWS on 29 August 1994, but was not the primary instrument until 1 November 1996, which was during the comparison period that ended on 9 September 2006.

The change to the AWS and 60-litre screen also affected temperature frequencies and extremes (Figure 5). However, as the up-step in the numbers of observations ≥95th day-of-year percentiles and a down-step in numbers ≤5th, the change is unrelated to the climate which underlines the fallacy of adjusting tails of data distributions without some *a priori* knowledge (and *post hoc*) assessments of the effect of site changes on extremes.

Figure 6. The large (230-litre) Stevenson screen at Hobart airport behind a 2.2 m Cyclone fence photographed from a distance by the Author on 20 October 2016; and right, the small (60-litre) screen at Inverell Research Station photographed on 15 March 2017.

8. Conclusions.

- By <u>not</u> adjusting for the Tmax step-change in 2002, ACORN-SAT failed its primary objective which is to "*produce a dataset which is more homogeneous for extremes as well as for means*" (p.2 Trewin (2018)).
- Tmax extremes are particularly vulnerable to the change from manually observed thermometers to rapid-sampling AWS-probes, and 230-litre screens to more sensitive 60-litre ones.
- Due to their much-reduced size, 60-litre screens are relatively poorly buffered to responding to parcels of warmer air from the ground, roads, buildings and passing vehicles that are not representative of the airmass being measured, and which mainly affect the warm-tails of daily data distributions.
- Use of statistical methods that use comparator data that are not homogeneous, and which failed to detect the prominent 2002 changepoint in Learmouth Tmax, are fatal flaws in methods used by ACORN-SAT to adjust Australia's temperature records.
- Use of faulty data to adjust faults in ACORN-SAT data has no statistical or scientific merit and as ACORN-SAT produces trends and changes in homogenised data that do not reflect the true climate, the project and its peers including others run under the guise of the WMO, should be abandoned.

Disclaimer

Unethical scientific practices including the homogenisation of data to create false narratives undermines trust and is not in the public interest. While the persons mentioned or critiqued may be upstanding citizens, which is not in question, the problem lies with their approach to data, use of poor data or their portrayal of data in their cited and referenceable publications as representing facts that are unsubstantiated, statistically questionable or not true. The debate is therefore a scientific one, not a personal one.

Acknowledgements

Impetus for this research arose from the creepy realisation, that spearheaded by WWF and teachers they should be able to trust, school children from primary school to Year 12; students at university, and the public at large have been groomed relentlessly by BoM, CSIRO, the Australian Museum, IPCC, the Climate Council and high-ranking professors to believe that the world is facing a tipping-point due to global warming caused by CO_2 for which there is no evidence.

Dr Neville Nicholls, who commenced as a cadet meteorologist with the Bureau of Meteorology in 1970[1] and later in 1986 was a member of the World Climate Research Programme when Dr John Zillman was Australia's permanent WMO representative and later President, oversaw BoM scientist Simon Torok's PhD and co-supervised Blair Trewin's PhD, which underpinned much of the Bureau's subsequent homogenisation effort. A contributor to the World Economic Forum[2], Nicholls is currently Emeritus Professor at Monash University and he is acknowledged for stirring my interest in the dark-art of using data homogenisation to create bogus climatic trends and changes. The damage wrought by elite scientists including Dr Sarah Perkins-Kirkpatrick, to the integrity of science in Australia, the national economy and the wellbeing and employment prospects of future generations in the name of climate change is deplorable.

Those who contributed ideas and discussion over many years included Geoffrey Sherrington, Ken Stewart (https://kenskingdom.wordpress.com/) and Tom Berger (http://www.elastictruth.com/). David Mason-Jones is gratefully acknowledged for providing invaluable editorial assistance.

Dr Bill Johnston

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[1] https://www.eoas.info/biogs/P003289b.htm
[2] https://www.weforum.org/agenda/authors/neville-nicholls