

Response to The Guardian, Temperature Series, Misinformation, And So Much More (Part 1)

Hi Graham

I received an email from you late yesterday indicating you are writing a story, which I assume you are publishing in *The Guardian* this weekend. I am of the impression that it will suggest my research into the Bureau of Meteorology's temperature data over the last decade amounts to 'harassment' and 'misinformation'. I also understand that you will primarily cite the work of former Bureau chief Greg Ayers in defence of the Bureau's current methods and its non-compliance with World Meteorological Organisation (WMO) recommendations, which are for the measurement of air temperatures as a numerical average rather than an instantaneous spot reading from electronic equipment.

You have asked for a response by 1 pm today. There is a lot to cover, and I only have a limited amount of time, moreover, I am fitting this response in among other commitments; therefore, I am labelling this Part 1. I will post Part 1 on my blog, with the intention of providing additional details in Part 2 when I have more time, and after the publication of your article.

1. LET'S NOT CONFUSE TEMPERATURE SERIES

I assume your immediate interest follows the provision of a limited amount of parallel data for Brisbane Airport following the Administrative Appeals Tribunal Hearing on 3 February that I attended with John Abbot. I note, however, that in the subject line of your email you write: 'Acorn-Sat and temperature records – response.'

The parallel data are the measurements as they are recorded at the same time and place by a mercury thermometer, which can be compared to temperatures as recorded by a platinum resistance probe connected to a datalogger. There are approximately 38 of these parallel data sets that run for 10 to 20 years each. These are held by the Bureau mostly as transcribed handwritten reports. It is the Bureau's policy to *not* make these handwritten reports public.

The ACORN-SAT (Australian Climate Observations Reference Network – Surface Air Temperature) records are something else entirely. These are the homogenised/remodelled temperature series that are promoted by the Bureau as showing global warming. ACORN-SAT data is publicly available and tends to show very different trends to the raw temperature data series for the same locations as archived in the Australian Data Archive for Meteorology (ADAM). ACORN-SAT is derived from ADAM following industrial scale remodelling.

- You can find the ACORN-SAT series at the Bureau's website here:
<http://www.bom.gov.au/climate/change/#tabs=Tracker&tracker=site-networks>
- You can find the ADAM series at the Bureau's website here:
<http://www.bom.gov.au/climate/data/>

The parallel data is secret. As I mentioned above and emphasise again, it is the Bureau's policy to *not* make these handwritten reports public.

I make this point upfront, because there has been much confusion regarding the availability of the parallel temperature data since Graham Lloyd's article 'Mercury Rising in BOM probe row' was published on the front page of *The Weekend Australian* last month.

To reiterate, the parallel data are the temperatures that are handwritten into the Field Books of Meteorological Observations, including both the temperatures as recorded by a mercury thermometer, and those from the platinum resistance probes, at the same place and on the same day. ADAM provides the observations from *either* probe *or* mercury, ACORN-SAT are the ADAM temperatures series remodelled/homogenised, while the parallel data are two sets of readings – from both probe and mercury on the same day at the same location.

I spent the first of several minutes of a pre-recorded interview with Michael Condon from ABC NSW Country Hour last month arguing with him about this. He was repeating incorrect information from the Bureau's Chief Customer Officer, Peter Stone.

Specifically, Condon incorrectly claimed that the Bureau makes all its temperature data publicly available on its website, including the parallel data. This claim, that is apparently being repeated across university campuses, flatly contradicts the opening paragraphs of Lloyd's article. Lloyd correctly explained that it was only after a Freedom of Information request, three years of arguing with the Bureau (including over the very existence of these Field Books/A8 reports and whether their release was in the public interest), and then the case eventually going to the Administrative Appeals Tribunal on 3 February 2023, that *some* of the parallel data for Brisbane Airport was released.

2. CURRENT DISPUTE

This current dispute is separate from my issue with the homogenisation process which produces the ACORN-SAT data.

The issues as reported over the last month in *The Australian* newspaper, on ABC radio's Country Hour, and Sky Television, following the hearing at the Administrative Appeals Tribunal is concerned fundamentally with the raw temperature data, ADAM, which I argue has been corrupted since the introduction of platinum resistance probes.

In short, we are arguably no longer comparing apples with apples.

It is important to compare data from mercury thermometers with data collected by probes since 1996, through in-depth analysis of the parallel temperature data, which the Bureau both refuses to make publicly available or analysis in proper detail.

Claims that there must be peer-reviewed of our preliminary findings is a red herring. Proper studies require that more parallel data be made available.

Peer review is a process developed to encourage rigour in scientific debates, but is increasingly being used as a bludgeon and shield against critic.

The matters raised by John Abbot and me are technical not scientific matters. The Bureau's refusal to accredit its process as conforming to WMO guidelines is a matter of quality control. Sunshine is the best disinfectant but the Bureau's refusal to release the parallel data – which would allow the apples with apple comparison – is a scandal of public administration.

Freedom of Information regulation exists to facilitate the release of such data held by institutions such as the Australian Bureau of Meteorology. It is true that I have pursued this issue with the Bureau and some members of its staff for close to a decade. But if they had acknowledged the genuine issue and the public interest in sharing the data, in say, 2015, we could have moved on. If I have, at times, speculated as to the motives behind non-compliance, that is an anterior not a posterior result of the Bureau's approach.

I mostly make mention of the maximum temperature data as recorded by a mercury thermometer. The three types of temperature series held by the Bureau: ADAM, parallel data, and ACORN-SAT also include minimum temperature series recorded by alcohol thermometers, which like mercury thermometers are liquid-in-glass as opposed to the electronic devices comprised of platinum resistance probes hooked-up to data loggers also known as automatic weather stations.

3. BACKGROUND AND MORE CONTEXT

Back in 2017, after John Abbot and I published a most important analysis of the application of machine learning for evaluating anthropogenic versus natural climate change (*GeoResJ*, Volume 14, Pages 36–46), you published a piece in *The Guardian* full of 'misinformation' that generated a good amount of 'harassment' and vilification.

While your 2017 article helped prolong a storm of personal abuse on Twitter – led by Gavin Schmidt, the director of the Nasa Goddard Institute for Space Studies – in the six years since then there has never been any criticism or rebuttal published in the peer-reviewed literature of that work in which we describe mathematically the natural cycles that have contributed to warming and cooling over the last two millennia.

It is now six years since you helped spearhead that attack, which attempted to have our paper retracted, yet it remains an important and published contribution to climate science – and it is beginning to be cited.

Your attack did prompt me to write a plain English rebuttal that many non-scientists have found useful in understanding the novel technique that John Abbot and I have developed over the last 10 years for forecasting not only temperature, but also rainfall.

It remains of concern, to both John Abbot and I, that with the mainstream climate science community refusing to consider the benefits of advances in artificial intelligence for mining historical climate data for more reliable forecasting of droughts, floods and cyclones,

ordinary people continue to suffer. Our series of peer-reviewed publications showing a better way are ignored because the Bureau remains wedded to the theory of catastrophic [human](#)-caused global warming and general circulation models for forecasting, despite their inability to replicate past cycles of climate change or demonstrated practical skill at forecasting even a few months ahead.

My plain-English rebuttal of your previous misreporting of our work, and some of our more technical climate science publications, can be found at climatelab.com.au.

Climatelab Pty Ltd is a company that I founded, and that has conducted consulting work in climate science, including with the Indonesian Bureau of Meteorology through a collaboration with the Queensland University of Technology.

Given your tendency over the years to mischaracterise John Abbot and myself primarily as 'IPA Staffers' and, variously, John as a computer scientist and myself as a biologist, before I answer the two questions that you sent late yesterday, and then make some comment on the limitations of Greg Ayers's published notes, please take the time to understand sometime of our qualifications and interests, detailed below.

In this, Part 1, I will elaborate on how the parallel data and the ACORN-SAT series, which you have made the subject line of your email, are different but related.

In Part 2, after the publication of your article, I will re-explain the public interest in the parallel temperature data that was the cause of John Abbot's most recent FOI application and which brought about the hearing at the Administrative Appeal Tribunal on 3 February this year.

Also in Part 2, I will likely explain how we intend to publish our findings as they pertain to the Brisbane parallel data, and also the parallel data that I hold for Mildura.

It is worth noting that there is a requirement for the Bureau to make the specifications for the four different types of custom-designed probes – which are now used across Australia for recording temperatures in automated weather stations including at airports – publicly available. There are also so many other issues to address. But let me begin by explaining the link between ACORN-SAT and the parallel data, given the extent of the confusion, including in – as suggested by – the subject line of your email.

4. ACORN-SAT IN CONTEXT

Back in 2014 I gave a talk at the Sydney Institute about the remodelling of temperature data in the creation of the ACORN-SAT series. The notes from this address are still relevant and can be accessed here: https://jennifermarohasy.com/wp-content/uploads/2011/08/Changing_Temperature_Data.pdf

These 2014 speech notes quote Gavin Schmidt from a Twitter conversation back in 2014 in which I explain why it is nonsense to use temperature data from radically different climatic zones to remodel and change temperatures as they were recorded by military personnel at

the airbase at Amberley, near Brisbane. Gavin Schmidt replied, '@jennmarohasy Your question is ill-posed. No-one changed the trend directly. Instead procedures correct for a detected jump around ~1980.'

If we look at the maximum temperatures recorded at Amberley, and also the nearby locations of Brisbane Airport and the Brisbane Botanic Gardens, for the period 'around 1980', we see that the annual average maximum temperature rose during the period of that drought, and then dropped somewhat dramatically during the wetter years that followed (Chart 1). This is often the pattern we see in raw temperature data across Australia before it is remodelled/homogenised.

Indeed, the longest available maximum temperature series for the City of Brisbane does not show a patten of warming consistent with global warming theory (Chart 1, green series).

This temperature series, which extends from 1896 to 1986, is perhaps one of the longest continuous series for anywhere in the Southern Hemisphere, with measurements taken by government meteorologists using standard equipment (a mercury thermometer in a Stevenson screen). The pattern in this temperature series is consistent with many others from northern and eastern Australia, showing cooling to about 1960 and then warming (Chart 1). Within the 60-year trend of cooling, followed by warming, there are shorter temperature cycles that tend to correspond with periods of droughts and floods.

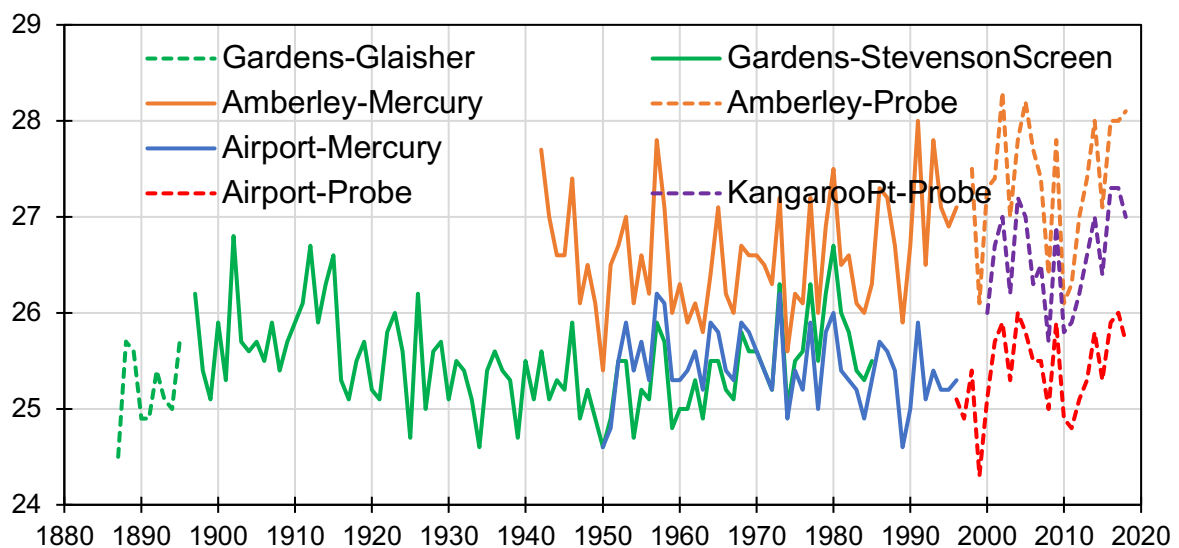
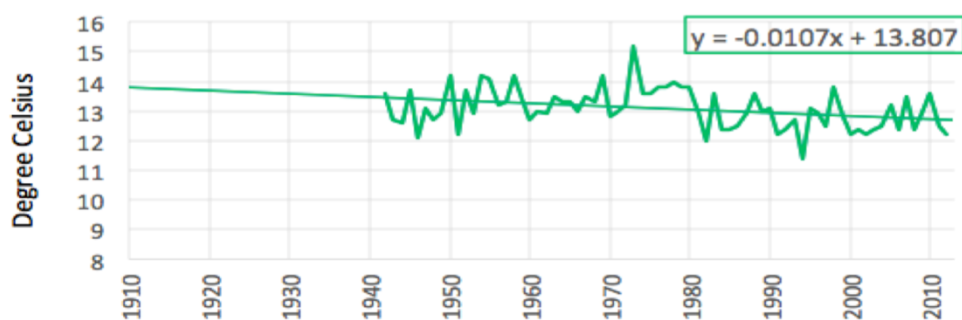


Chart 1. Annual mean maximum temperatures recorded in the Brisbane region based on publicly available ADAM temperature series.

It is the case that minimum temperatures at Amberley, for example, cooled after 1980; key institutions around the world have remodelled this reality, changing the cooling to warming, as shown in Chart 2 (Figure 3 in my notes from my talk to the Sydney Institute).

Fig. 3. Amberley Minimum Temperature Series 1941 to 2013
 Green is unhomogenized, cooling by 1 degree per century



Red is the official record, warming by 2.5 degree per century

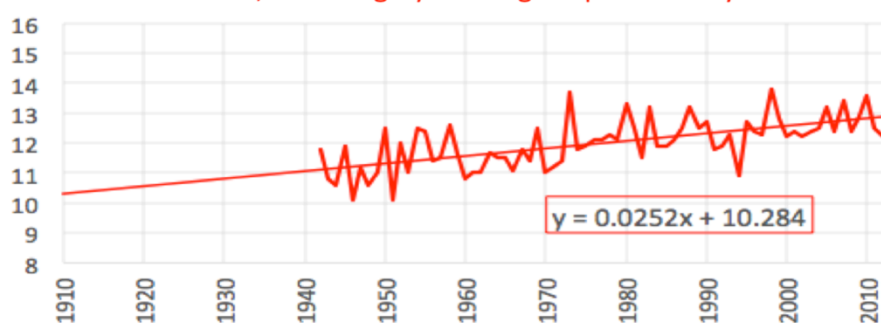


Chart 2. The Annual Mean Minimum Amberley (near Brisbane) temperature series, green is based on daily values downloaded from the ADAM database, red is based on daily values downloaded from the ACORN-SAT series at the time I gave the Sydney Institute address back in 2014. The ACORN-SAT temperatures are continually revised.

If Twitter was around at the time George Orwell was writing the dystopian fiction *Nineteen Eighty-Four*, I wonder whether he might have borrowed some text from Schmidt's tweets, particularly when words like 'procedures correct' refer to mathematical algorithms reaching out to 'nearby' locations, which are in fact across the Coral Sea and beyond the Great Dividing Range, to change what was a mild cooling trend at Amberley from 1941 through to 2013, into a dramatic warming one, for an otherwise perfectly politically incorrect temperature series.

The temperatures at Amberley were correctly measured in the first place, and yet the Bureau has changed them with the creation of its official database ACORN-SAT. These are temperatures that were recorded before the introduction of resistance probes with data loggers in the late 1990s.

It is my contention that since November 1996 the system the Bureau has used for temperature collection may not be fit for purpose, and indeed may need to be remodelled.

While the Bureau – quoting former director Greg Ayers – claims its new method, which is taking the last one-second reading each minute using resistance probes connected to a data loggers, provides a maximum temperature reading equivalent to a traditional mercury

thermometer, at the same time the Bureau admits to needing to remodel/homogenise temperatures from locations as distant as Darwin and Cape Otway, because of the equipment changes. This is logically inconsistent. Indeed, as Graham Lloyd, reported back in 2019: 'The bureau has defended its homogenisation processes, which it said were needed to account for non-climate influences and changes in equipment.'

You can find that story here: <https://www.theaustralian.com.au/nation/climate/darwin-warming-claim-triggers-challenge-to-bom/news-story/bba138e1feb1c270b08b7e22c92f8659>

The question for me continues to be whether the probes that have replaced mercury thermometers at most of the Bureau's 700 official weather stations are recording the same temperatures that would have been recorded using a mercury thermometer. The Bureau is not consistent on this point.

5. JOHN ABBOT & JENNIFER MAROHASY – BRIEF RESUMES

John Abbot has qualifications in science including a BSc from Imperial College London, an MSc from the University of British Columbia, a Master of Biotech from The University of Queensland and a PhD from McGill University. He has published more than 100 papers in peer-reviewed journals. He has held research and faculty positions in universities in Canada and Australia in chemistry and chemical engineering departments, as well as in industry, over a combined period of more than 20 years. His research includes studies of complex kinetic phenomena relating to industrial processes.

During the past decade, he has undertaken research relating to climate phenomena with a particular interest in application of neural networks, a type of AI, resulting in more than a dozen research publications collaborating with myself. Studies include forecasting rainfall in Australia, with several published papers each receiving more than 100 citations in the scientific literature.

Dr Abbot also has qualifications in law with Juris Doctor and LLM degrees from the University of Queensland and has been admitted as a solicitor. He has published papers in legal journals including topics relating to obtaining climatic information through Freedom of Information.

I am a scientist with experience in processing data, including temperature data for long-range weather forecasting. I have worked with the Indonesia Bureau of Meteorology (BMKG) under contract with the Queensland University of Technology teaching statistical modelling techniques for long-range weather forecasting.

The accuracy of my rainfall forecasting method, developed with John Abbot and using a sophisticated statistical model based on advances in machine learning, is dependent on the integrity of the historical temperature record. Our method for rainfall forecasting is detailed in peer-reviewed publications in international climate science journals.

I also have a long-standing interest in evidence-based public policy. I am a public intellectual with a weblog, hundreds of articles published by Fairfax Media, News Ltd including in *The Australian*, and I have appeared on various Australian Broadcasting Corporation programs including the Q&A panel and The Science Show.

6. GREG AYERS'S ANALYSIS/Q2. READFERN EMAIL

You write:

'A former BoM director and CSIRO scientist, Greg Ayers, has published peer-reviewed papers testing several of your claims. Namely, on the potential effect of using automatic readings from the final second of each minute on temperature records and trends, and whether the bureau's automatic probes effectively are an average over the previous minute (satisfying WMO guidelines). Ayers says critics should publish their findings in peer-reviewed journals, but he says he has "seen a lot of assertion but not much science" and he, together with a climate scientist, question why critics of the bureau do not publish their specific claims in reputable peer-reviewed journals. How would you respond to that?'

It is our intention to publish our findings, ideally this will be after the Bureau releases the 12 years of parallel data that it continues to hold for Brisbane Airport, and key A8 reports that it has withheld from me for Mildura, particularly the parallel data for Mildura pertaining to September 2012.

Considering the analysis by Greg Ayers, which will be discussed in more detail in our published papers and reports, the following includes some preliminary thoughts, shared in goodwill.

What Ayers appears to have done is validate the temperature probes under ideal or near ideal conditions. Note that I can't speak to the actual conditions at the sites he used, but I assume that he would generally choose sites that met good practice, Mildura excepted, which he apparently picked out because I had highlighted it.

The scatter in the samples in his papers is low: for example, Fig 16, page 179 of Ayers, shows the differences in Tmax and Tmin (1 second) for the Mildura site and the equivalent four sample averages. They are minimal, suggesting that noise is low and the system is generally well-behaved. There are very few samples beyond $\pm 0.075\text{C}$. This is what he would have hoped to see, and why he published the paper. It does make his point quite well.

However, my preliminary analysis of the Brisbane data tells a different story. The relevant chart is the scatter plot of the difference (Chart 3).

Daily difference, probe minus mercury

Brisbane airport, August 2019 - July 2022

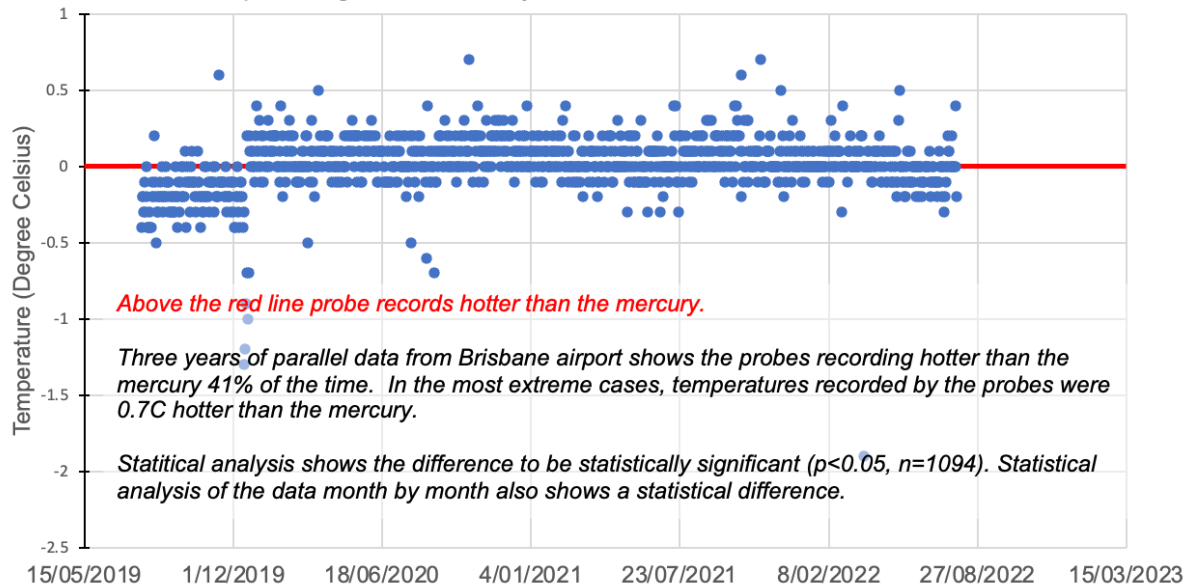


Chart 3. The difference between daily values after transcribing the numbers from the A8 Forms over the Easter break. This information was provided to both News Ltd and the Bureau, about a week before I published the same at my blog.

In the Brisbane data most of the daily probe samples are at least 0.1 C away from the mercury and there are a lot that are more than 0.2 C away. The question is why?

What is the expected measurement error of the mercury thermometer?

What happened in early December 2019, both with the very low readings followed by the step change in average reading, as shown in Chart 3? Was there a fault followed by a repair and recalibration? If this is the case, why is the ADAM temperature series is complete for this period, and shows no quality issues?

Overall, the Brisbane data show there is a lot more scatter than Ayer's papers would suggest, and some of it is well over ± 0.5 C. Why?

If the Bureau wanted headlines supporting global warming, more scatter is better: you get more hot day records that way.

The advice to me from an analogue engineer who has expertise in this type of measurement is:

As you know, I would start by investigating RF (radio frequency) interference as a source of the scatter. This can be a source of both random and systematic errors.

On a different note, I have not been able to find any information about the temperature probes referred to in the papers by Greg Ayers.

Do you have any photos of one?

The temperature probes I have seen on the Rosemount website are industrial probes suitable for both liquid and air temperature measurement. In liquids they respond quickly, with a time constant of a few seconds. In air, the response time is much longer, depending on the air flow, humidity, etc. Intuitively a settling time constant of 40 – 80 seconds in air seems reasonable, although I've never tested one in air myself. [Ends]

I do not understand why the Bureau does not make this information public, including time constants and pictures of the probes used at Brisbane and Mildura over the years.

The Bureau has transitioned from probes of a lesser mass balance and likely longer time constant to a 4mm version that is likely to produce a greater scatter for the same weather. It uses probes from at least 4 different suppliers, and claims each are custom designed. The specifications have never been published. They are a secret.

I have been asking for this information, including through requests both to Rosemount and the Bureau, since at least 2015. It is critical to understanding the Bureau's measurement technique particularly given there is no numerical averaging as recommended by WMO.

7. OTHER ACCUSATIONS/Q1. READFERN EMAIL

You write:

One climate scientist is quoted as saying the criticisms of the bureau's temperature record amount to "harassment" and characterises them as "misinformation". While this comment is not directed at you, you are named in the story and have been at the heart of many of the criticisms in the past. How would you respond to the assertion that the bureau has been subjected to harassment and misinformation over the course of the last decade? [Ends]

I have always acted in good faith. In the case of the Brisbane data, when it was finally provided to me, I spent my Easter break copying numbers from more than 1,000 handwritten reports and undertaking a preliminary analysis. These values, by way of an Excel spreadsheet, and my analysis were provided to the Bureau via Graham Lloyd at *The Australian*. A full week before I made any media comment the Bureau had an opportunity to show the errors in my analysis. Nothing of substance has been forthcoming. Rather, instead, there has been a misinformation campaign suggesting that the parallel data is already public – by confusing it with the ACORN-SAT series.

There has been no harassment on our part. All the Bureau needs to do is produce the data that John Abbot and I have reasonably requested over the years and without undue delay.

The harassment, obstruction and misinformation has been by the Bureau. As reported by John Abbot in *The Australian* earlier in the week:

It is important to know the temperature measurements from the different types of equipment, if reliable continuous temperature records are to be constructed for each site so that temperature changes in recent decades can be accurately compared with earlier records extending back to the start of the industrial era.

Small differences in temperature measurement between the two types of equipment, perhaps 0.2 C to 0.5 C are not negligible in the context of global warming where the public is constantly being told that a rise of 1.5 C above pre-industrial era will have dire consequences.

The original FOI request for parallel temperature data for Brisbane Airport was made in December 2019, as well as other sites at later stages.

One of the tactics used is to allege that the documents requested do not exist. The documents requested did exist as they were referred to in BOM reports that list the sites at which parallel temperatures have been collected and the time periods. The proof is that we have finally received parallel temperature for Brisbane after more than 3 years, showing claims to the contrary were nonsense.

Another of the tactics used to prevent, or severely limit, public access to government held documents is to erect cost barriers. This was indeed the case with the BOM. The agency involved is entitled to calculate an approximate processing cost in providing the documents requested under FOI.

However, FOI legislation allows an applicant to request a fee waiver, for example on grounds of hardship or public interest regarding the information sought. The BOM rejected my fee waiver request on public interest grounds. The BOM stated that the parallel temperature data sought was only of personal interest to me, and that I stood to gain financially because I could use this information in the course of my employment. It is astonishing that the BOM could take the position that accurate quantification of atmospheric temperature changes over the past century has very little or no general public interest when the public is constantly being told that there will be drastic consequences for the planet if the threshold of 1.5 C atmospheric temperature increase is exceeded.

An applicant is permitted to request a review by the Australia Information Commissioner if unsatisfied with decisions made by a government agency regarding accessing documents under FOI. In July 2020, I requested a review by the Information Commissioner on two counts – existence of the documents requested and secondly the issue of fee waiver on public interest grounds. The OAIC agreed with the BOM on the non-existence of the documents and has so far made no finding on the second count after nearly two years. [Ends]

Thank you for the opportunity to respond.

Yours sincerely, Jennifer Marohasy BSc PhD. Noosa Heads, May 5, 2023