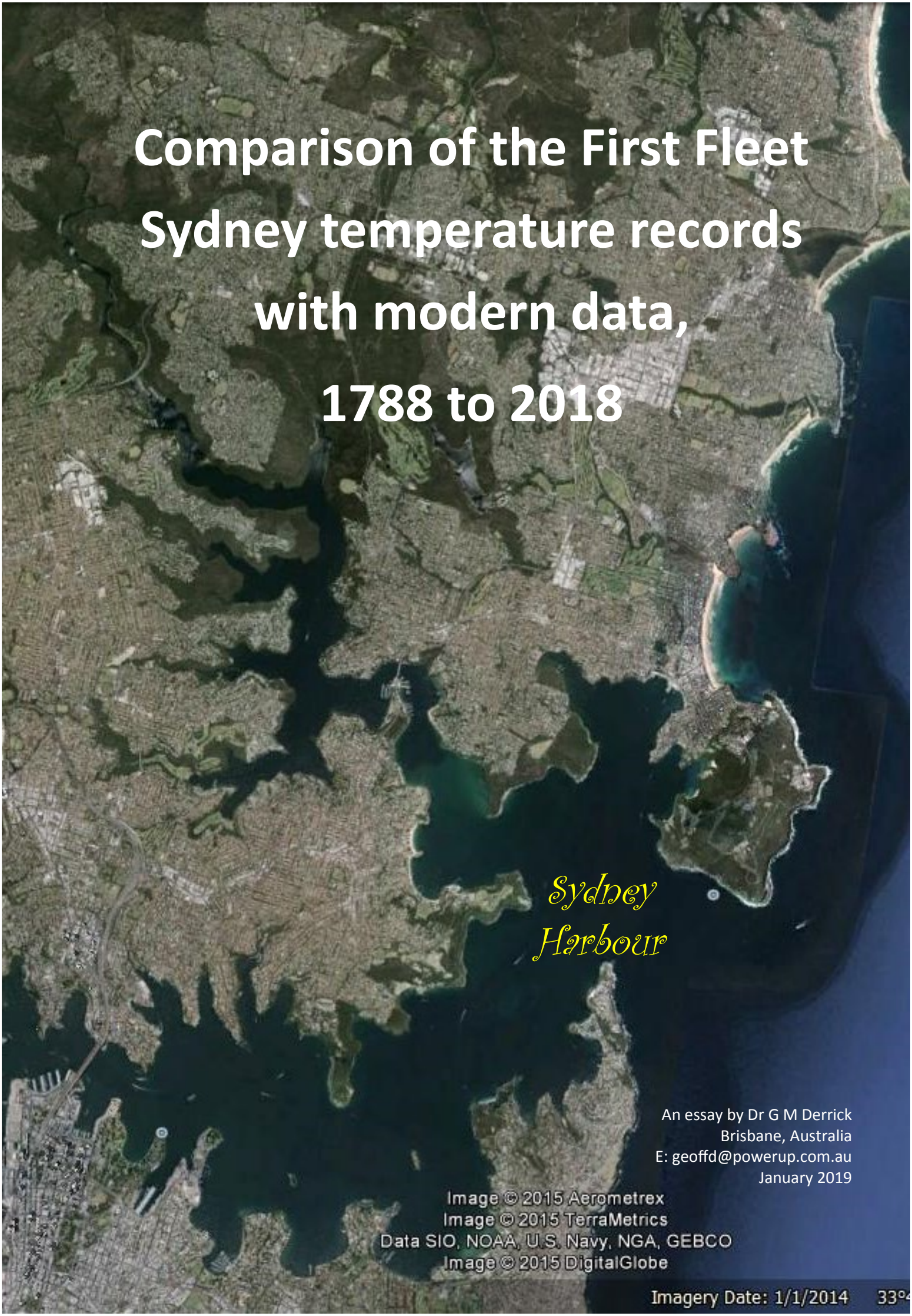
Comparison of the First Fleet Sydney temperature records with modern data, 1788 to 2018



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Executive Summary

1. Notwithstanding a data gap from 1791 to 1859, there appears to have been little or no change in the trends of monthly maximum and minimum temperatures for a period of 230 years, from 1788 to 2018, based on comparisons of two data sets—one recorded by First Fleet officer William Dawes, and one from the Bureau of Meteorology (BOM).

2. Gergis et al 2009, authors of a major study and compilation of the data, conclude that "Remarkably, the records appear comparable with modern day measurements taken from Sydney Observatory Hill, displaying similar daily variability, a distinct seasonal cycle and considerable inter-annual variability."

This runs counter to the climate alarmism normally published by these authors.

1: Establishing Temperature Measurement in Sydney 1788 – 1791

Australia was colonised by the British in 1788, following the recommendations of Captain James Cook, who sailed up the east coast of Australia in 1770. The First Fleet, commanded by Captain Arthur Phillip, passed majestically up the harbour looking for a suitable landing spot at which to establish the new penal colony, watched no doubt by many of the Aboriginal population on headlands of the harbour, bemused by these ship-borne visitors who would be changing their lives forever.


Figure 1

Phillip landed at Sydney Cove on 26th January 1788 and raised the Union Jack, taking possession of the land for Britain and calling the landing site 'Sydney' (Figure 1). This view would be to the north.

An officer with Phillip, William Bradley, was responsible for taking temperature measurements on board the ship Sirius anchored in Sydney Cove, commencing on 27th January 1788, and continuing until 14th September 1788, when a land-based observatory could be established nearby by William Dawes, who recorded temperatures 6 times per day over the period 14th September 1788 to 6th December 1791 (Gergis et al., 2009), at a site near the right of the painting shown in Figure 2, close to the present-day station at Observatory Hill, shown in Figure 2 as the central prominent hill at the top of the picture.


Figure 2

Figure 2: The First Fleet in Sydney Cove, 27th January 1788. Observatory Hill is the prominent hill in the central part of the painting, which is by John Allcot, painted in 1937. View is to the WSW.

Figures 3 and 4 below compare a sketch map of Sydney Cove prepared by Dawes in July 1788 with a map of modern Sydney; the observatory measuring site is shown with a red circle in each figure.

Figure 3

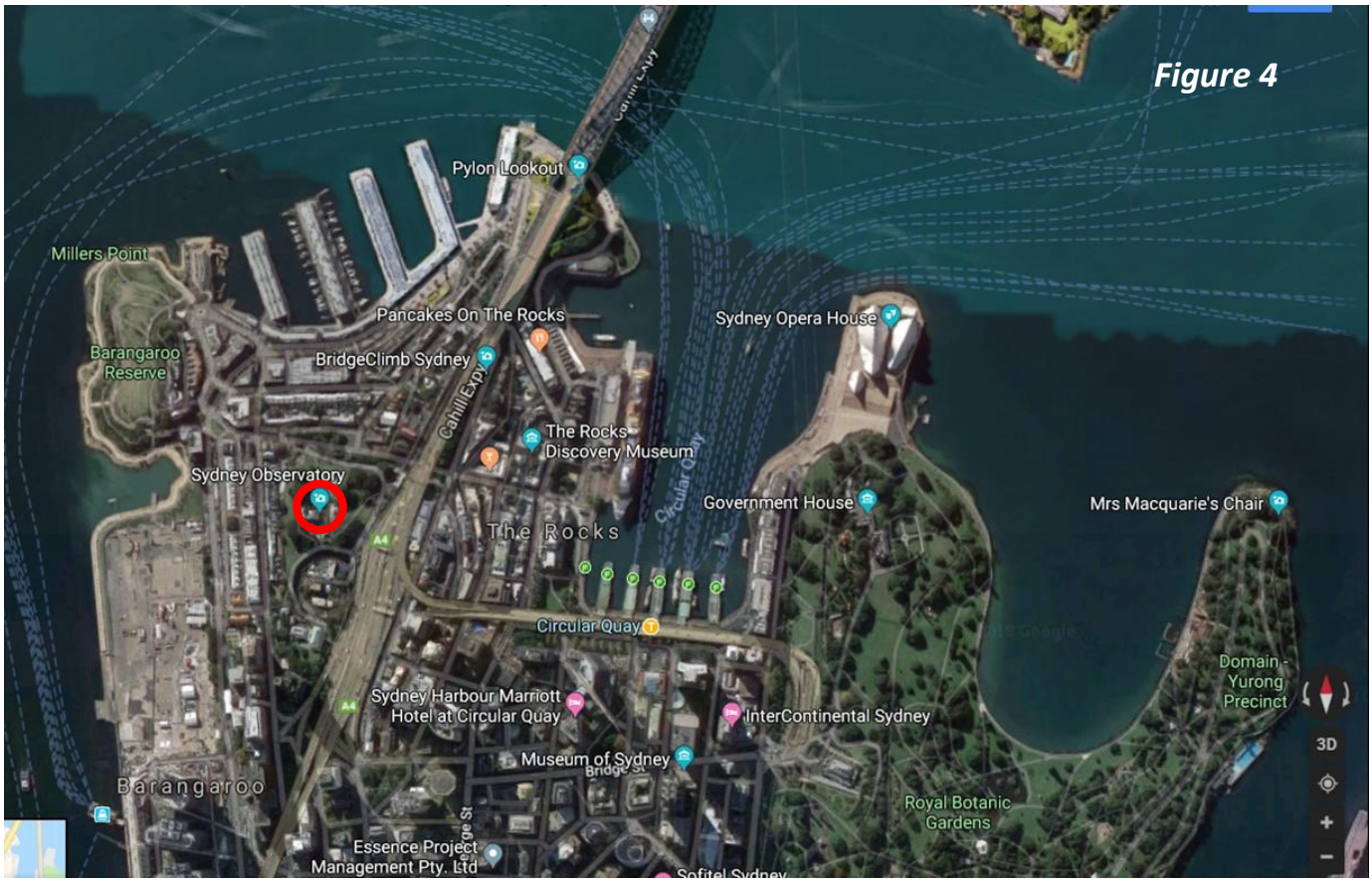


Figure 4

2: Temperature records from Sydney 1788 – 1791

The temperature records of Bradley and Dawes at Sydney Cove were not discovered until 1977, when they were unearthed by a diligent researcher, Robert McAfee (McAfee (1981).

In his own words (McAfee, 2010):

> *"When I was a grad student at the University of Wisconsin-Madison I received a telegram from Professor Edward Linacre of Macquarie University, Sydney, Australia, offering me a position as a tutor in climatology in the School of Earth Sciences. I accepted this offer without hesitation. Through 1977-1980, I read a number of general history texts and audited some history classes at Macquarie. I began what would become nearly weekly forays to the Mitchell Library in Sydney, where I examined the published accounts written by members of the First Fleet who arrived at Port Jackson in 1788.*
>
> *On one of my expeditions of discovery to the Mitchell Library, while examining volumes of the Philosophical Transactions of the Royal Society, I was reading through a section called* ***"Gifts Received"****. An entry appeared:* ***A Meteorological Journal at Port Jackson, 1788-1791 by Lieutenant William Dawes.*** *I was excited beyond description. Immediately I asked one of the Librarians about the possibility that this might be in the Mitchell Library. There was an exhaustive search and it was not in the Mitchell.*
>
> *I wrote to the Royal Society in London and asked if the Meteorological journal was still in their possession. After some time I received a reply that it was there and would I like a copy. I was told it was quite a large journal. I requested a copy and agreed to cover any costs for reproduction and postage. I received the journal compliments of the Royal Society. This would form a very substantial foundation for a history of climate in Australia.*

In 1981 I returned to the US to write my PhD thesis which was submitted in August of that year. The thesis was the culmination of five years of exhaustive research, documentation, and putting together as comprehensive as possible a history of the climate in SE Australia."

Figure 5: Dawes' journal on display in London

1791 Sept.	Winds		Weather	Bar.	F.	D.	Remarks
4. 6. A. M.	W by S	2	F. C.	29,606	50.0	38.5	Dew 12 or 16 grains
9	N W by W	3	F. C	,616	52.8	53.0	⊙
noon	East by S	1	F. C.	,604	61.1	61,6	⊙ The funnel was placed
3	South by E	3	F. C.	,600	62,3	63,2	⊙ so that the mouth should
Sr.	East by S	3	F. C	610	56,5	57,0	truely horizontal. The water
9	Unc.	1	F. C	628	49,5	49,8	caught in the bottle, carefully
5. 6. A. M.	W N W	2	Scat. Clo. F	29,653	45,0	45,0	Dew 20 or 24 grains
9	W. N. W	2	F. C	,686	52,7	53,2	⊙
Noon	East by S	4	Scat Clo F.	,604	63. 5	64,0	⊙ ,604
3	East by E	4	Scat Clo. F.	,672	61,8	62,6	⊙ ,672
SS	East by S	1	Scat. Clo. F	,682	56,3	56,7	weighed in a pair of Apothecaries
9	Unc.	1	Fair Clo F.	,694	48,0	48,4	Scales. A piece of rosin
6. 6. A. M.	Unc.	1	Very foggy	29.686	44,0	44.0	Dew & fog 28 or 34 grains
9	W by S	2	Fine weather Clo.	,696	53, 5	53.8	⊙
noon	East by S	4	Fr scat. Clo.	,566	64. 0	64, 5	⊙ about 3 Dist. thunder
3	East by S	4	Fr scat. clo.				At 4 Mod. Sh. of rain. Not
SS.	East by S	4	heavy Bro Clo	,570	58,7	59. 2	at home the funnel was set
9	N. E by E	3	bro Clo Th. Lt	,590	58,0	58,4	out till about 3/4 of the rain had
7. 6. A. M.	Unc.	1	Foggy	29.571	49. 5	49.0	fallen. What was caught might
9	Unc.	1	[illegible] clo.	,578	56,8	57,3	at 9 dist. thun & lightning for 2
Noon	East by S	4	bro Clo Fr.	,555	66. 0	67.0	① Dew & fog 10 or 14 gr.
3	East by S	4	Fr. Clear.	,505	64.8	65,2	⊙ ...ton was then carefully
SS	East by S	2	Fr. C.	,511	59,5	59,8	⊙ with which the sides of the
10	Unc.	1	Cloudy	,546	57,9	58,3	funnel was afterwards
8. 6. A. M.	W by S	2	rather Clo?	29.540	50, 5	50.8	Dist Thund & Li from S
9	W by S	3	Fr. Rain clo	,560	59.0	58. 5	Dew about 5 grains
Noon	East by S	4	Fr. Rain clo	,541	67.0	67.5	⊙
3 1/2	East by S	4	Fr. C.	,497	65.0	65.4	⊙ ...as dry as possible then
SS	East by S	3	Fr. C.	,497	61.6	62.0	⊙ weighed again. The whole
9 1/2	East by E	3		,514	60,2	60,6	weight of water thus found
9. 6. A. M.	Unc.	1	Foggy	,510	49,0	49,5	Dew weighed 23,8 grains
9	N by E	2	Fine hazy	,511	57.2	57.6	⊙ suppose + about 3,2
3 1/2	East by S	4	Fine hazy	,394	72.0	72.6	⊙ ...was then set down in a
SS	East by S						number after which follows
11					67.5	68.0	by estimation the quantity
10 A.M.			Clo. showr.	,414	67,7	68,3	
9	W. by S	2	Fr. C.	29,403	55.5	55.8	No Dew. Rain about 5 grains
noon	West	2	Fr. C. L.	,463	67. 5	68.0	⊙ ...till unavoidably left off
3	East by S	4	Fr. C.	,441	76.0	77.0	⊙
SS	East by S	4	Fr. C	,421	66.+	66.7	871. 3 72,0
11	Unascert.	2	Fr. C. L.	,421	66.1	66,7	
		1	Fr. C.	,456	52,8	53,5	the sides of the funnel

Figure 6: A sample page from Dawes' journal

The page illustrated above is for a 7-day period from 4th to 10th September 1791; column 1 shows that measurements were made up to 6 times per day, at sunrise, 9am, noon, 3pm, sunset, and 9 to 11pm; columns 2, 3 and 4 tabulate wind and weather conditions, and barometric pressure. **Column 5** displays the temperature measurements in degrees F. On September 10th for example, sunrise temperature of 55.5° F rose to 76°F at noon, and fell to 52.8° F by 11pm.

Dawes can justly lay claim to be Australia's first meteorologist (Figure 7).

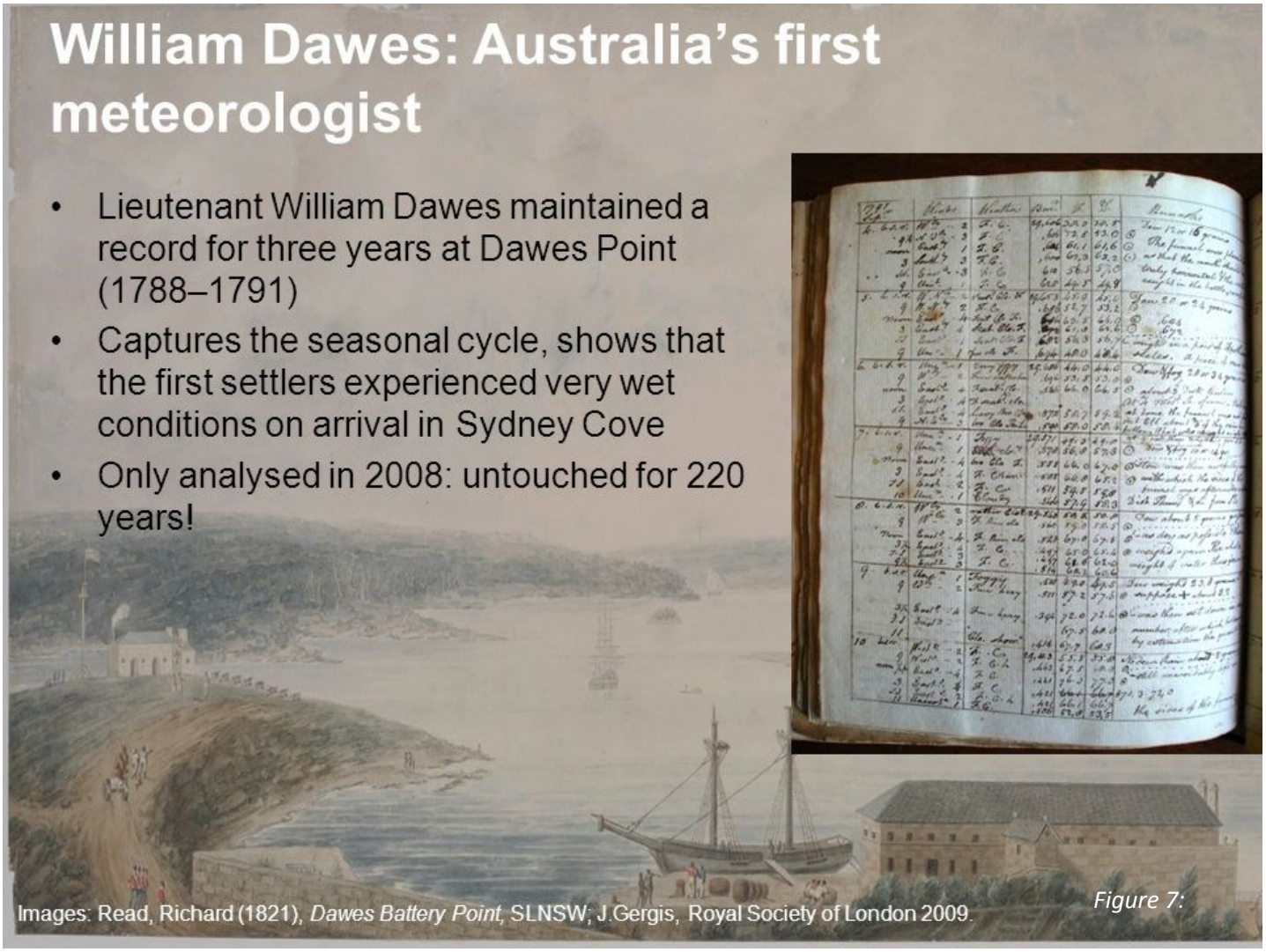


Figure 7:

3: Temperature data from Sydney 1788 – 1791, compared with modern data

From the data of Dawes and Bradley assembled by McAfee, Gergis et al (2009) calculated average-maximum and minimum temperatures records for each month over the period September 1788 to December 1791. Gergis et al note that because maximum and minimum thermometers were not in use at that time, the calculated maximum and minimum average temperatures can only be a close approximation to reality.

The Dawes/Bradley data provide information for the period 1788 to 1791; Gergis et al (2009) extracted $\mathbf{T_{max}}$ and $\mathbf{T_{min}}$ data for this period, but also extracted the same data from the Bureau of Meteorology databases for the period 1859 to 2014; this data has been upgraded to extend to 2018. The BOM data summary to 2018 is shown below. There is a data gap from 1791 to 1859.

View: Main statistics / All available | Period: Use all years of data | Text size: Normal / Large

Statistics	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Years		Plot
Temperature																
Mean maximum temperature (°C)	26.0	25.8	24.8	22.5	19.5	17.0	16.4	17.9	20.1	22.2	23.7	25.2	21.8	160	1859 2018	
Mean minimum temperature (°C)	18.8	18.8	17.6	14.7	11.6	9.3	8.1	9.0	11.1	13.6	15.7	17.6	13.8	160	1859 2018	

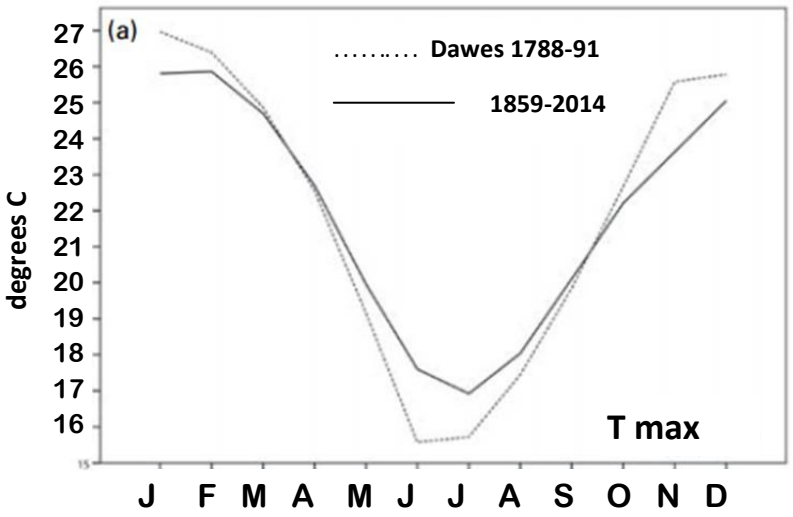
3: Temperature data from Sydney 1788 – 1791 compared with modern data *(continued)*

Gergis et al (2009) produced data from Dawes as Table 1 below, and plotted that data in Figures 8 and 9, **T max** and **T min** respectively; the graphs also show conversion of Fahrenheit to Centigrade.

Table 1

Temperature data for Sydney Cove, 1788-1791—Monthly averages for Tmax and T min, as measured by Dawes and Bradley (McAfee, 1981, Gergis et al., 2009)

Monthly means (all years)	Tmean (°C)	Tmax (°C)	Tmin (°C)
January	22.9	26.9	18.8
February	22.9	26.4	19.5
March	21.2	24.9	17.6
April	18.8	22.6	15.0
May	15.2	19.2	11.3
June	12.3	15.6	9.0
July	11.6	15.7	7.5
August	12.4	17.4	7.4
September	15.6	19.9	11.4
October	18.2	22.6	13.8
November	20.7	25.6	15.9
December	22.1	25.8	18.4



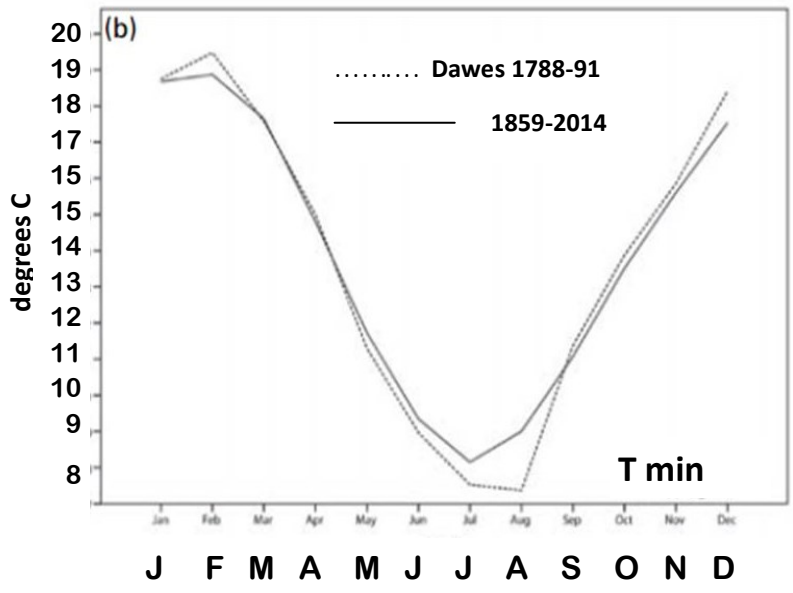


Figure 8a,b: Basic plots of Tmax and Tmin for the period 1788-1791 at Sydney Cove, as listed in Table 1, shown as dotted lines. Data for the period 1859 to 2014, taken from the Australian Bureau of Meteorology (BOM) database, is also plotted as a full line. The graphs show that the First Fleet data is almost indistinguishable from the 1859 to 2014 data. *(Gergis et al., 2009)*

4: Replotting of Temperature data from Sydney 1788 – 1791 and the BOM record 1859 to 2018

The relationship between First Fleet data with 1859-2014 data has been made previously in Figure 8a and 8b, but the line graphs are plain and lack clarity. The same data has been replotted using the BOM graphing tool for further clarity. BOM data has been updated to 2018.

In Figures 9 and 10 below, all BOM data is shown as GREEN circles for both Tmax and Tmin. Reference should be made to the Y axis temperature scale in Degrees C.

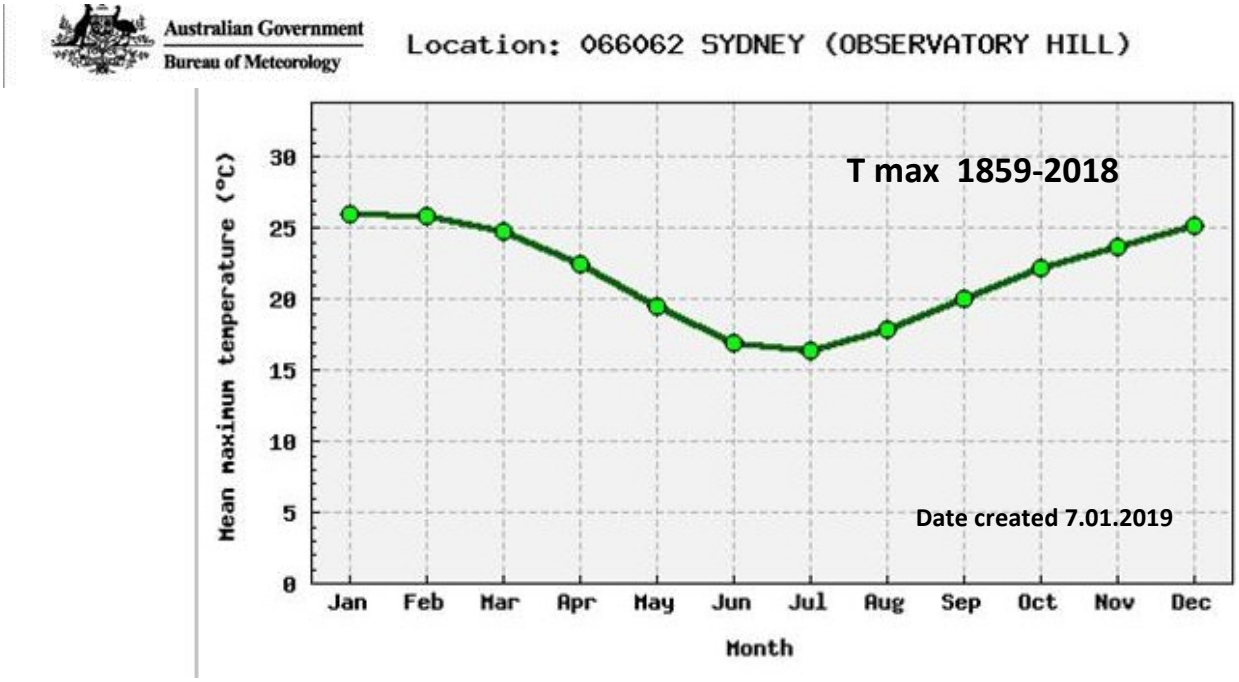


Figure 9: T max data from Sydney Observatory for the period 1859 –2018, in degrees C (from BOM)

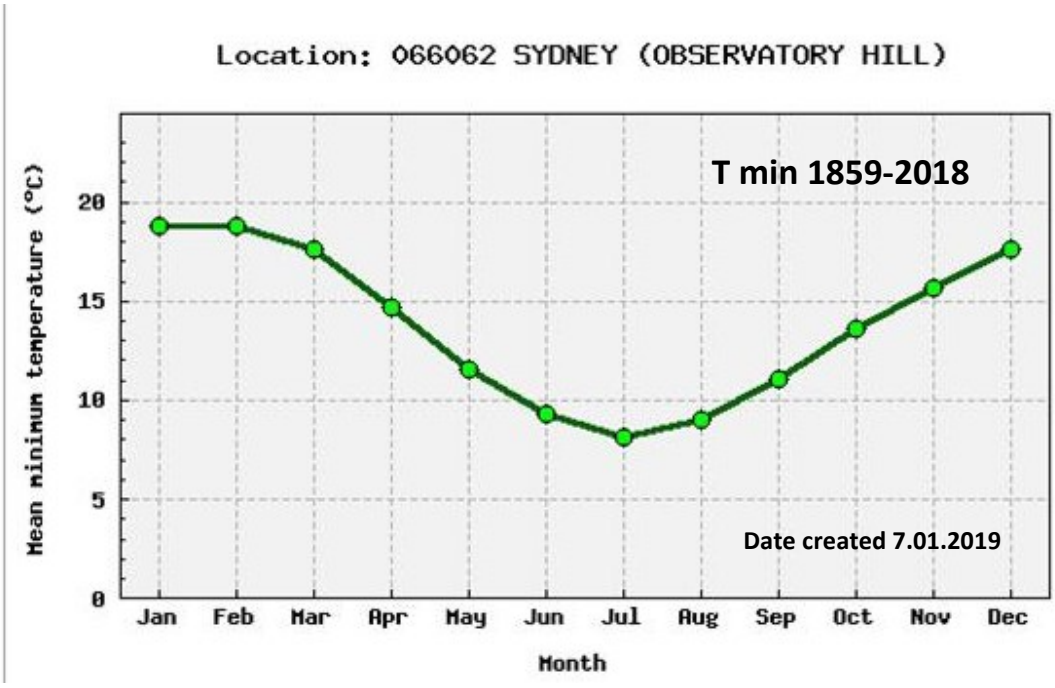


Figure 10: T min data from Sydney Observatory for the period 1859 –2018, in degrees C (from BOM)

5: Addition of First Fleet Dawes' data 1788 to 1791 to BOM data 1859 to 2018

Figure 11 below, shows the early data of Dawes for Tmax **(RED circles),** 1788 to 1791, compared to the Tmax BOM record (green dots) from 1859 to 2018.

Similarly, Figure 12 shows the early data of Dawes for Tmin (blue circles) 1788 to 1791, compared to the Tmin BOM record (green dots) from 1859 to 2018.

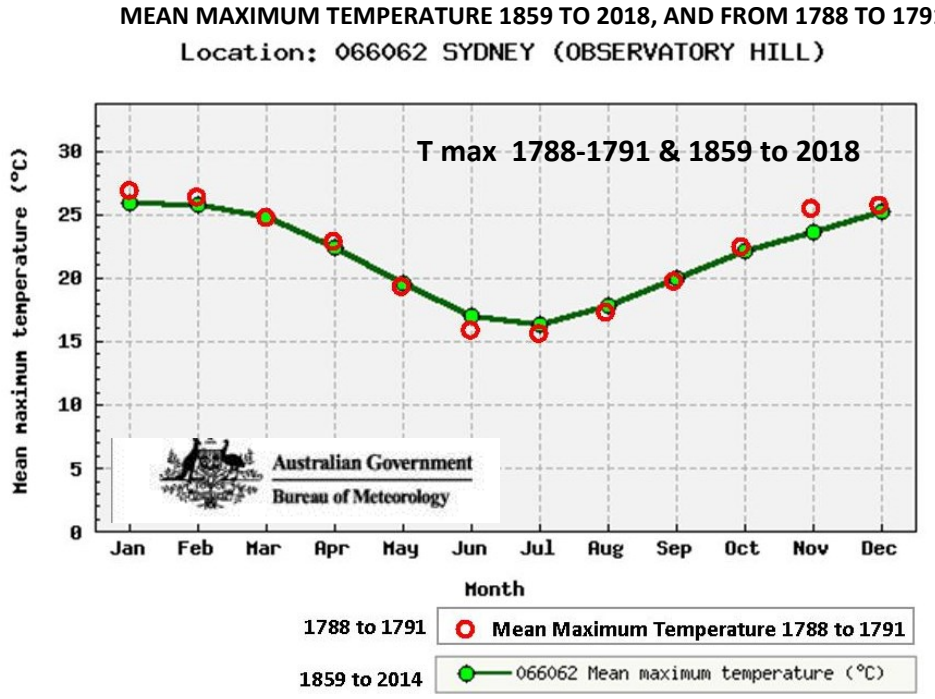


Figure 11: Tmax for the period 1788-1791 (red circles) compared with BOM data for the period 1859 –2018 (green dots), in degrees C. The temperature averages for both periods are almost identical

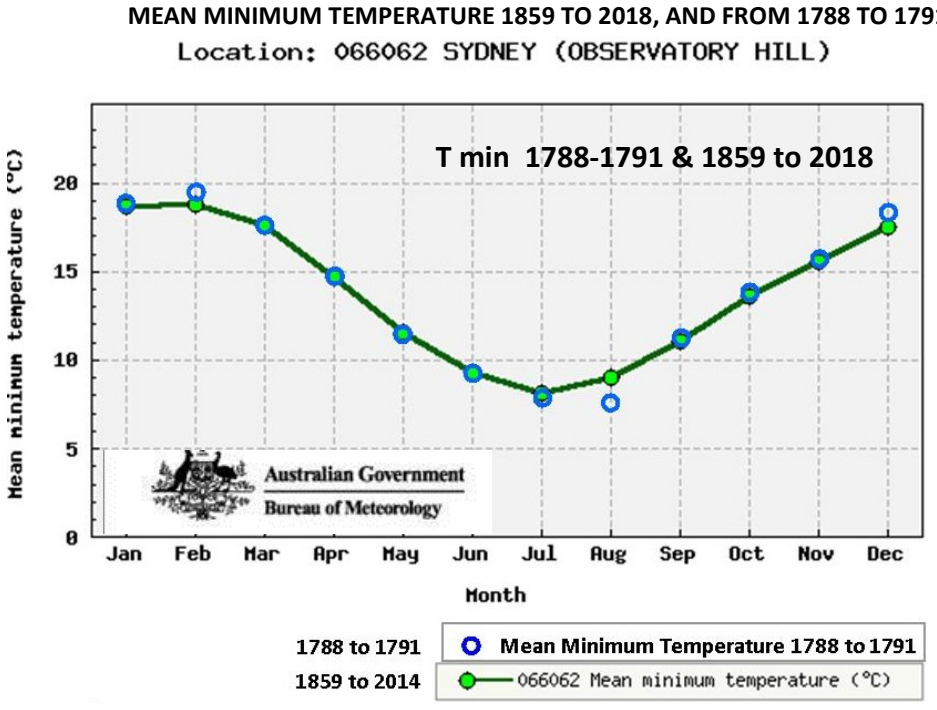


Figure 12: Tmin for the period 1788-1791 (blue circles) compared with BOM data for the period 1859 –2018 (green dots), in degrees C. The temperature averages for both periods are almost identical

CONCLUSION : Despite a 68-year gap in data from 1791 to 1859, we conclude that there has been NO significant change in Max and Min temperature trends at the Sydney Observatory station for at least a period of 226 years, from 1788 to 2018.

References and Citations

Gergis, J., Karoly, D.J., & Allan, R.J., 2009: A climate reconstruction of Sydney Cove, New South Wales, using weather journal and documentary data, 1788–1791. Australian Meteorological and Oceanographic Journal 58, pp. 83-98

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