

***Interactive comment on “The “Dirty Weather”  
diaries of Reverend Richard Davis: insights about  
early Colonial-era meteorology and climate  
variability for Northern New Zealand, 1839–1851”  
by A. M. Lorrey and P. R. Chappell***

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It was a pleasure to review this article on some of the earliest meteorological observations available for Australasia. The paper is well written, generally well researched, and is of clear value because of the scarcity of early to mid-19th century data in the Southern Hemisphere. The use of PICT and the comparison between several observational and palaeoclimatic sources of historical climate information in particular is a useful method of verifying and improving the value of historical observation, especially in the data poor SH region.

C1910

However, there are some shortcomings of the historical data that I feel have been overlooked in the excitement of uncovering such a rare record. The unreliability and biases that exist in all historical data, particularly temperature data, need to be considered and acknowledged. There are also some decisions in the methodology that need to be explained, to strengthen the findings of the study.

My suggestions to address these issues are below, as well as some finicky edits to be considered for the final version.

Major suggestions

S2.1. I feel that the reference needs to be mentioned earlier on in this section, rather than just at the end. I spent most of this section thinking ‘how do you know that?’ Perhaps on L8 (p3803) you could add something like ‘according to his memoir, written by friend and correspondent Reverend John Coleman’.

S3.2. First paragraph. You need a couple of references here supporting your claim that the ship-based obs can be considered reliable. The barometers may have been calibrated when they set off, but a lot of things can happen at sea. Additionally, the accuracy of many marine barometers was more to aid navigation rather than make high-quality meteorological records. For clarity, I would also move the first sentence of the first paragraph to the first sentence of the second paragraph. Otherwise it sounds like the NIWA data covers the same period as the diaries. I would also like to know a bit more about the differences/similarities between the Kaikohe and Waimate North data and the VSCN data.

P3807,L4: Over what period did you calculate this established relationship? This could be answered by providing a bit more information about the data availability at the Kaikohe and Waimate North stations, and also mentioning the method is discussed in section 4.3.3.

P3811,S4.2.2. Perhaps there is a logical reason, but I’m not sure why you are mention-

C1911

ing the climatologies here, only to ignore them until the next section. Why not remove the first sentence from section 4.2.2 and put it at the start of S4.2.3, and swap Figs 3 and 4?

P3812,L8: You probably need to clarify exactly how you reduced the pressure to sea level. Reference the WMO equation, mention the heights used and state that you used the noon temp obs as the station temperature. Also, if you have converted the pressure observations to SLP, why are you using station pressure in this section?

S4.3.1. I think you need to add some consideration here to the standard thermometer enclosures that were used in the early to mid-1800s. Davis may not have known about the state of the science at the time, but then again he may have done if he was so well read. Parker (1994) is your best bet.

S4.3.2. Why did you only look at the 9am values?

S4.3.3. It is interesting that Davis reported hotter summers and colder winters, as we found a similar thing in our analysis of historical Australian records (Ashcroft et al., 2014). However, this is the exact behaviour of poorly exposed or badly ventilated thermometers (Parker 2004; Nicholls et al. 1996; Bergström and Moberg 2002). You have to mention this somewhere in the paper.

S5.3.1. You cannot conclude this section without some mention of the influence that sub-standard instrument exposure would have had on the temperature observations. I'm not saying that your results are not valid, and in fact you can argue that the palaeo comparisons support the assumption that the temperature obs are accurate. However, historical thermometer exposure can have an impact on the monthly temperatures in the range of the anomalies you have identified, and this caveat needs to be mentioned.

Minor edits

3800, L11: midday or mid-day

P3800,L17: Add 'that' between indicate and southerly.

C1912

3801,L25: Just add a couple of adjectives about James Hector, for people unfamiliar with NZ's history (e.g. Scottish geologist, or one of New Zealand's first geologists).

3803,L6: en dash instead of hyphen between dates. I would also add 'in Australia' to the end of this line, for northern hemisphere readers.

3803,L8: Name of ship needs to be italicized

3803,L14: Referring to Figures 1 and 2 is helpful, to show readers where There locations are.

S2.2, first paragraph. A reference would be useful here.

P3804,L8: therein, not there in

P3804,L9: Could it be useful just to remind NH readers that summer is December–February and winters are June–August? Up to you. Maybe just add the word 'austral' to clarify.

P3804,L10: mention the Fig 2 inset here.

P3805,S3.1. Change the title to 'location and "rescue" of. . .', or 'locating and "rescuing" of. . .'

P3805,L19 and beyond: Sometimes the diary is referred to in capitals, and other times not. In the figures you then refer to the diary as the Reverend Richard Davis meteorological diary (RRD). This is a bit confusing. It doesn't really matter which option you choose, just be consistent.

P3810,L11: I think present tense is correct here (i.e. 'is' not 'was').

P3810,L22: 'to whom he often wrote', not 'who he often wrote to'

P3811,L2–5: What's your reference for this? It would be helpful for other researchers also looking into historical barometers. The best references I have are Knowles Middleton (1964 and 1969).

C1913

P3811,L19–20: remove the full stops after a and b.

P3814,L7: remove the comma after site

P3814,L10: en dash not hyphen between February and April

P3814, L21: austral is lower case I think

P3815,L1–2: I think it would be more helpful to provide the range of r values here, rather than just the maximum value.

P3815,L22: August-mid September of what year?

P3815,L28: en dash between July and December

P3816,L5: Fig 3, not Fig 1.

P3817, L3: I would rewrite this line to read “Commentary related to “rivers in flood” in the David diary indicates that...”. Its current form is a bit jarring.

P3817,S4.6.2. Did Davis adjust those pressure observations himself? Please clarify.

P3818,L13: I think you mean Table 3.

P3818,L 15 and 25: en dash rather than hyphen

P3819: Can you provide a reference for the historical accounts of snowfall in Northland? Is there a NIWA list of snowfall events, for example? It would be useful for future researchers.

P3820,L15: Reference Table 2 as well as Fig 3.

P3821,L7: Where is the mean winter temperature of  $-0.6^{\circ}\text{C}$  from? Is it an anomaly? Relative to what reference period?

P3822,L27: en dash

P3823,L4: Please provide a reference for this statement.

C1914

P3823,L10: We have recently published some of this work so you can refer to it if you like (Ashcroft et al. 2015). You're right, it will be useful to compare and integrate!

P3824,L6: You should probably reference Compo's 20CR or Cram's ISPD paper here.

S.5.3.2. This section would read a lot better if you added an introductory sentence explaining that it is difficult to compare the atmospheric situations of the Northland snowfall events.

P3825,L1: en dash

Figures

Fig 1. At the end of the caption, I would add 'where David lived', just to give context for the image.

Figs 3,5 and 6. You might want to consider using line styles for these graphs, as well as different colours, for colour blind readers or those who have printed the article in black and white.

Fig 8. The x-axis of the bottom figure is a bit confusing. Can you spell out the acronyms used in the caption or the figure?

Fig 9. I think it is less confusing if you refer to the 'four proxy sites' as 'the Reverend David diary temperatures and three tree-ring proxy data series' in the caption, as you do with Figure 10.

#### References

Ashcroft L, Gergis J, Karoly DJ (2014) A historical climate dataset for southeastern Australia, 1788–1859. *Geoscience Data Journal* 1:158–178. doi: 10.1002/gdj3.19

Ashcroft L, Gergis J, Karoly DJ, (2015). Long-term stationarity of El Niño–Southern Oscillation teleconnections in southeastern Australia. *Climate Dynamics*, online view. doi: 10.1007/s00382-015-2746-3

C1915

Bergström H, Moberg A (2002) Daily air temperature and pressure series for Uppsala (1722–1998). *Clim Change* 53:213–252. doi: 10.1023/a:1014983229213

Knowles Middleton WE (1964) *The History of the Barometer*. The John Hopkins Press, Baltimore, 489pp.

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Nicholls N, Tapp R, Burrows K, Richards D (1996) Historical thermometer exposures in Australia. *International Journal of Climatology* 16:705–710.

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