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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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We thank the reviewer for their overarching supportive comments about our analysis.

P3806 Calibration of barometers. This is a really important question raised by the reviewer. Here, we have done our best to compare to local observations that are available to us, which come from military/exploration ships that were based in a harbor that was in the line of sight from the Davis residence. While the temporal overlap is short, we see consistency in terms of the relative offset for three vessels that came into port.

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It would have been likely that during the time these vessels were anchored in Bay of Islands, they would have checked their instruments against either the harbourmaster or other vessels present. In addition, it is likely that Davis would have taken the opportunity to check his measurements against others who may have recorded pressure locally – This may actually be the reason why there are comments about Davis noting erroneously high measurements for the second part of the weather diary, which were ‘discovered’ then corrected. We are likely dealing with a mercury barometer here, although several other early records from New Zealand indicate that by the 1850s dual measurements from aneroid and mercury instruments were being undertaken by some individuals associated with the Church Mission Society.

Inevitably, the homogenization of the pressure series can be dealt with via the data assimilation process used to generate the extended reanalysis without radiosondes. When they are fed into the reanalysis, this also affords an extra opportunity to gauge the data quality if enough complementary contemporaneous data exist.

P3807. Regression equations, correlation coefficients will be presented in more detail in the supplement. As a side note, we consider this a potential source of bias in our reconstructed temperature, which would warrant further work.

P3808. This is an excellent comment from the reviewer, and one of broader interest that we get asked about in palaeoclimate research. A greater detail that explains PICT can be added to the text here, citing more from Lorrey et al., (2013). The reviewer has asked a key question about whether there any assumptions of stationarity that may negate the PICT approach – to this we respond that for the maritime climate setting of New Zealand, there is an inescapable stationary in terms of the response of regional climate to incident circulation. If one deals to significant effects of anthropogenic greenhouse forcing on local temperature, then what remains is the result of incident atmospheric circulation, which advects the characteristics of warmer or cooler waters onto the country (ie more northerly, it is warm and the opposite associated with more southerly flow). We utilize global reanalysis data that are all detrended and as such,

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the focus and result of the reconstructed temperatures remains inextricably linked to atmospheric circulation and how it guides the mean climate state at a local scale. For individual years when volcanic eruptions would have impacted temperatures, that forcing would need to be accounted for, however we are not dealing with that in this paper. We consider solar variability contributions negligible during the time the diary covers, but that too would need to be accounted with older records during periods of solar minima.

We recognize there are tenable connections to synoptic type occurrences for NZ that guide temperatures seasonally, and high latitude climate modes like PSA and wave pattern 3 that have some correlations with heterogeneous Antarctic sea ice patterns. However the fundamentals in this area still need to be explored in more detail to go beyond simple correlation to causality.

P3811. Pressure measurement offset will be described better – it essentially indicates that if we corrected the data for altitude, it would directly overlap the ship log observations.

P3817-3818. The reviewer asked if any other studies have reconstructed cyclones over the region in mid 19th century? Fes DeScalley and Pat Nunn did work for the Pacific in general while Diamond et al. 2012 presented a comprehensive review of tropical cyclone tracks for the SW Pacific basin back to 1841. The latter is probably the most reliable work that is published. However, recent analysis of merchant marine cyclone track compilations provided by the UK Met Office (published after WWII) indicate the Diamond et al., 2012 study can be augmented – and may possibly reveal the culprit of the ex tropical cyclone that impacted Davis's observations.

P3818. Last paragraph here is repeated on page 26 so remove If it is repeated, we apologize and will remove the repeat section – but having looked at the text we can find no repeat as mentioned. Maybe there was an error in the PDF that the reviewer downloaded...

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P3820. We can improve the clarity and terminology about what was done here to indicate how we are comparing the Davis diary temperature data

P3821. What does 'changes' mean? We think the referee is commenting on the synoptic type frequency change results (and Figure 8, not Figure 7), which can be edited for clarity to indicate these are synoptic type frequency changes based on palaeodata and the Davis diary, relative to modern climatology.

P3822. Are the differences in extremes due to the thermometer that was used? These extremes are single daily values, and we do not think that they have to do with the type of thermometer. We do need to acknowledge however that the cool bias for the most extreme temperatures (particularly minimum ones) could be due to poor ventilation.

P3823. Provide references for proxy of past ENSO activity – Happy to augment this sentence with references to the studies in the revised version of the manuscript.

Figure 9. We can amend colour scale so the temp anomalies are easier to see and will take guidance from CP editors on this front.

Interactive comment on Clim. Past Discuss., 11, 3799, 2015.

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