

Review of Tropical forcing of increased Southern Ocean climate variability revealed by a 140-year subantarctic temperature reconstruction by Turney et al.

General comments

This paper used a new dendrochronology from trees in sub-Antarctic islands Campbell and Macquarie to build a temperature reconstruction back to 1870. The paper addresses a need for more information about past temperature variability in the high southern latitudes, and uses a number of approaches (including models, reanalysis, weather observations and ecological data) to support the findings made by the reconstruction. The article is well written and prepared, and generally makes a good effort to enhance the reproducibility of the study by describing the tools and programs used.

However, I am concerned that the authors have not considered the scarcity and poor quality of observational data in the high southern latitudes in some aspects of their analysis. This issue may confound some of the conclusions drawn, and affect the independence of the different lines of evidence they use to make their arguments. Overall I believe it should be published subject to major revisions.

Specific comments

Line 98: You say that Macquarie Island is highly sensitive to Rossby wave propagation, but the correlation values don't seem that high in Figure S4 (~0.3–0.4). Can you expand on this claim, or soften it?

Section 2.1: This section is a bit unclear. What quality control has been done to the AAE data? Where are they available? You also mention comparing the satellite SSTs to the AAE reports, but was SST recorded during 1912–1915? Is this the Buckles Bay measurements, or are they the Bureau of Meteorology records? A version of Table S1 here might make this section more clear.

Section 2.2. This section (and Tables S2 and S3) confused me. What are you trying to show? That the interannual variability of the AAE data is within the modern range? That there is a temperature trend? What are the statistical results relative to?

Figure 3: Do you have a possible explanation for the disagreement between the obs and the reconstruction in the 1950s?

Section 3.2. To me this section makes more sense at the start of section 2.3, as it does not add much here.

Section 3.3. From where does HadISST get its data? Given the data scarcity in these high latitudes, it would be worth confirming that HadISST does not have the same data as Loewe, or has not approximated the Bureau's air temperatures as SSTs, given the high level of agreement between the two.

Section 3.3 as well. Chelton and Raisin (2016) mention that there is an increase in standard deviation in HadISST from 1949, at least over the North Pacific, due to artifacts in the dataset. It would be worth acknowledging this or even better, arguing that your dendrochronology results show a real variance increase that is independent of this artifact in the observational data.

Section 3.4. This is a nice additional independent line of evidence, I look forward to reading the future research.

Line 376–380. Historical wind data are notoriously rubbish (e.g. Jones et al. 1997; Jakob, 2010). I’m suspicious of drawing any conclusion on AAE wind data unless you have good metadata about where exactly the wine vane was located.

Jakob D. 2010. Challenges in developing a high-quality surface wind-speed data-set for Australia. *Australian Meteorological and Oceanographic Journal* 60: 227–236.

Gallego D, Garcia-Herrera R, Calvo N, Ribera P. 2007. A new meteorological record for Cadiz (Spain) 1806–1852: Implications for climatic reconstructions. *Journal of Geophysical Research* 112, DOI:10.1029/2007jd008517.

Lines 444–445: You say that “The close similarity between the LOVECLIM output and HadISST argues against any bias in the latter dataset for this region”, however you have forced LOVECLIM with HadCRUT3. As I understand it, HadCRUT3 gets its SST data from HadSST2, which in turn gets its data from ICOADS. HadISST also uses COADS data (the precursor to ICOADS) to increase data coverage, although I’m not sure exactly where. You need to check the data sources for the region for both datasets to claim that these results are independent.

Technical corrections

Line 10: I would reverse this sentence to improve readability: “SAM and ENSO play a dominant role in this as modes of large scale variability”.

Line 129: Macquarie Island were, not was.

Lines 197 and 198: I think you mean Figure S11 and S12.

Line 263: I’d put a comma after limiting, the sentence is a bit confusing otherwise.

Line 289: add a ‘to’ after the word limited

Line 359: data are

Figure 1, and Figures S1–S3: What is the source of the data fields you are plotting? I’d also add °C to the colour bar just for clarity.

Figure 1: South Georgia is labeled as SG in the image, but GI in the caption.

Figure 2: Consider using dotted/dashed lines for colour-blind readers.

Figure 3: I would make the orange block lighter to make the graph easier to look at.

Figure 4: Consider changing the colours here to grey and black for colour-blind readers.

Figure S4: Which areas are significant? Those that are shaded? Please clarify. You could even add the significance threshold correlation value.

Tables S5 and S6 could be swapped so they are in the order in which they are mentioned. This goes for the figures and supplementary figures as well. At times I got a little lost because the Figure references were not in order (e.g. Figures 8 and 9 mentioned before Figures 5–7).