

Interactive comment on “Tropical and mid-latitude forcing of continental Antarctic temperatures” by C. S. M. Turney et al.

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Overview: The paper provides an interesting overview of potential atmospheric circulation relationships with temperature changes across Antarctica, using a new proxy record from the South Pole. The paper finds a period of dominance on Antarctic temperature from circulation in the Southern Indian Ocean during 1940–1970, and then a dominance from the southwest Pacific Ocean from 1980–onward.

In general, the paper is a good advancement of the understanding of tropical and mid-latitude atmospheric circulation influence on Antarctic temperature variability. I find in particular the different influence of the southern Indian Ocean in the 1940s–1970s and the latter influence of the southwest Pacific, consistent with tropical Pacific variability and/or ENSO, intriguing. My main concerns are with some of the analysis, and a need

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to better place the tropical Pacific work in light of more tropical/mid-latitude literature on Antarctic climate variability.

Main comments:

1. I think the paper could be strengthened significantly by adding a few lines and references to the joint role of ENSO and SAM on Antarctic climate, as outlined by L'Heurux and Thompson (2006); Stammerjohn et al. (2008); Ding et al. (2012); and some of my work (Fogt and Bromwich 2006; Fogt et al. 2011). From your GPH composites in Figs. 7E and J, there is both a SAM structure as well as a PSA structure in the Pacific (also seen in Figs. 6E and J). I think a discussion of both of these modes and their interaction is needed on the discussion of potential tropical / ENSO variability on lines 4-25 on page 7.

2. The discussion on increased ENSO variance and therefore a lowering of pressures in the SWP is misleading. Increased ENSO variance doesn't necessarily mean more El Ninos, and over the last 30 years, the SOI and Pacific SSTs have actually been trending towards a more La Nina-like state (consistent with the shift in the PDO). There are quite a few papers on this, but some of my work at least addresses this shift in austral spring (Clem and Fogt 2015, JGR). Notably, these trends towards increased La Nina events probably aren't significant anymore given the strong El Nino currently developing, but the way this is written makes it seem like the circulation in general is trending towards more El Ninos, and this isn't the case currently, at least not consistently.

Minor comments:

1. Page 1, line 19: suggest changing 'has' to 'have' since I believe the subject is 'latitudes'.

2. Lines 27-28: I think this sentence about tropical and midlatitude pressure anomalies playing a larger role than hitherto believed is a bit strong, and should be worded more cautiously, more like 'this work adds to a growing body of literature confirming the im-

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portant roles of tropical and midlatitude atmospheric circulation variability on Antarctic temperatures' or equivalent.

3. Page 2, Line 28: The Ding et al. (2011) reference here talks only about the role of tropical Pacific SSTs, so using the words 'global SST' is not accurate.

4. Figure 4 (and supplementary figures): I wonder why the region for the SWP was chosen as it was, as there are stronger / larger areas a bit farther north and west towards NZ? I hardly can imagine this changing the results much, but it just seems odd that the region chosen was not in the center of the darkest shading in Fig. 4.

5. Page 6, Line 11: Change 'Figure 7' to 'Figure 8'

6. Page 6, Lines 27-28: suggest deleting the 'did not lead but' on line 27 since this is repeated on line 28.

7. Page 7, lines 7-9: "Conversely, with increasing ENSO variance, the southwest Pacific pressure anomaly apparently weakens (Figure 4)." This is not at all clear from Fig. 4, since there's no linkage on that figure from ENSO variance. You can infer this however from comparing the red and blue curves on Fig. 3, and I would agree that after 1940 as ENSO variance increases, the SWP pressure anomaly decreases. This however is not clear in earlier times, perhaps due to the uncertainty of the 20CR (but this may be constrained here somewhat due to records in New Zealand and Chatham Island starting before 1900). During 1870-1920 there is a clear increase in ENSO variance, but the SWP anomaly doesn't decrease at this time. I think some comment on this needs to be made, and in general the statement on these lines needs to be better justified.

8. Figure 10 needs to be made much bigger and clearer.

Interactive comment on The Cryosphere Discuss., 9, 4019, 2015.

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