

## ***Interactive comment on “Optimal site selection for a high resolution ice core record in East Antarctica” by T. Vance et al.***

**T. Vance et al.**

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Received and published: 4 January 2016

With respect to using ERA-Interim rather than ERA 20C in the main text, we appreciate the referee's time to consider this data issue. The lack of data at southern high latitudes is something anyone interested in decadal variability in this part of the world laments regularly!

At the outset of this manuscript, we also thought it seemed best to present the ERA-Interim data as part of the main text, and to use the ERA 20C reanalysis for confirmation of the previous negative IPO cycle (and that we would put this analysis in the supplementary information). However, we had a couple of major problems with this, which we failed to discuss clearly in the manuscript. (We propose to discuss this more

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clearly in the revised manuscript, see below).

The first problem is that if we used ERA-Interim we would only sample negative years that are at the beginning of the current negative phase. In contrast, by using the 20C reanalysis, while we lose a great amount of data prior to 1979, what we do gain is a full negative cycle. That is, we sample negative years that span the full range of the negative phase, either side of the minima. Its is quite likely that the phase change of IPO (either minima or maxima) matters more than whether years are arbitrarily below or above a threshold. Because of this, the ERA-Interim analysis only samples negative years from when the IPO is trending more negative, and not from when it is still negative, but trending positive. The spatial pattern between these two 'types' of negative years may be quite different.

The second problem is that we have no way of knowing what the imprint of warming and high GHG's has on the current negative phase, and this may have quite an effect that is not evident, or not as evident from the 20th century negative phases. We would also like to note that there is no reason why two different negative phases should have exactly the same spatial pattern, similar to the fact that different El Niños rarely have the same anomaly patterns, so we would not necessarily expect the two composites presented to look exactly the same, but rather we would expect/hope that they would have similar characteristics. For the context of this manuscript, the three possible sites all sit close to the boundary between anomalies that flip sign from positive to negative in both composites – which is great for our purposes. Because of this, we wanted to use ERA 20C in the main text but with the caveat that data sparsity is a problem, and present the same analysis using ERA-Interim as supplementary material. Furthermore, as we are interested only in broad spatial patterns at this stage, we feel that using ERA 20C was appropriate for the main text. We would like to keep this format, as we think it is important to not rely heavily on 1979-present when investigating processes that are decadal in nature.

We propose to re-write two sections to discuss the above more clearly, and would prefer

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to keep the current format for the reasons outlined above. The re-written sections would be Section 3.5 (from line 357 to end of section) and section 4.6 (lines 605 to end of paragraph).

Minor comments: Page 5076, Line 20 – I felt this needs an introductory sentence “Filling in a data sparse regions with new ice core records will contribute to our understanding of regional and global scale climate processes but the location of ice core sites requires careful site selection”. Then lead onto constraints.

We propose to do this, as suggested. The new text would read: Filling in data sparse regions with new ice core records will contribute to our understanding of regional and global scale climate processes, but the location of ice core sites requires careful site selection. Unfortunately, ice core site selection is not governed solely by the local climate response and its preservation in the ice core record. Rather, site selection is primarily restricted by both glaciological and logistical constraints, with optimal site positioning from a climate processes perspective being constrained to this restricted domain.

Page 5077, line 12 – Sentence structure. “These include three sites from the WIAS. . . . .”? ...?

We propose to restructure this sentence as follows: “Three sites that do largely meet these criteria are the. . . . .”

Line 24 – add timescale eg . . . . .over the last 2000 years?

Propose to add in timescale as suggested.

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Interactive comment on Clim. Past Discuss., 11, 5073, 2015.