

Interactive comment on “Review of regional Antarctic snow accumulation over the past 1000 years” by Elizabeth R. Thomas et al.

Anonymous Referee #1

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Overall comments

The authors compile some 80 Antarctic ice core records that meet their requirements for temporal coverage, time resolution, and corrections for layer thinning. The records are grouped into regions, composited, and then the regional trends and variability over the past 200-1000 years are discussed. Finally, estimate an overall increase in SMB of ~44 GT since 1800 AD, with much of it occurring within the past couple decades. In general, the paper is very well written and logically organized. It is hard to find a major fault with this paper. It is an accomplishment just to compile the records, requiring the cooperation of scientists from many nations and reflecting many years of field work. If anything, the paper is a bit too guarded and tentative at times: “However, this is just a qualitative explanation, more research using model and field data would be needed to prove this.” or “The reduced period of overlap...makes this interpretation less

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reliable.” and many other examples. Caveats are of course a natural part of science, but the inclusion of so many in this paper prevents it from being the final word on snow accumulation or even a paper that would get cited a lot (perhaps they are planning a Nature paper that will pack more punch.).

Specific comments

Affiliations, page 1: I think some of the affiliations are incorrect, please check. For instance, I believe B. Medley is at #9 (NASA), not #10 (U Victoria).

Abstract, line 14: increase in SMB across grounded AIS of ~44 GT since 1800: Some context for this number would be helpful. Is that a lot in terms of mitigating SLR? What is the SLR equivalent? Does this number make sense in terms of published global sea level budgets over the past 100-200 years (is it in the noise or a significant number?)?

Page 4, first paragraph: Given the projected increase in SMB, is it expected to offset overall ice sheet mass loss; is Antarctica expected to be a net contributor to SLR given the overall mass budget?

Page 4, line 30: PAGES Antarctica 2K community: Only a select few readers may know what PAGES is, let alone the 2K community. Define?

Page 6, lines 11-14: Was there any requirement for proven dating precision and accuracy? Are we assuming that all of the records are perfectly dated?

Page 8, lines 19-20: “predominantly positive phase of the IPO/PDO.” There was a major shift in the PDO/IPO in 1998-1999, from positive to negative, affecting more than a third of the 1979-2010 period. This has been shown to impact a number of Antarctic climate trends and it may even be reflected in the recent increase in accumulation in the AP and the decrease in VL. So, I don’t think it is accurate to say the the IPO/PDO was predominantly in its positive phase.

Pages 13-14: “The principal teleconnection associated with the Rossby wave propagation from the western tropical Pacific...which originates from the central, tropical

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Pacific.” This sentence is repetitive, as well as contradictory (western Pacific vs central Pacific). A rewrite is needed.

Also, in the discussion of the VL and AP composites (sections 3.24 and 3.26), I can't help but notice that the teleconnection patterns of these two regions are roughly opposite in sign. See Figure 4d and 4f. I'm surprised this isn't mentioned somewhere in the paper. 4d resembles the trend pattern associated with the negative PDO, which could have played a role in the recent increase in AP accumulation and decrease in VL precipitation. I also wonder why tropical teleconnections aren't mentioned with respect to AP accumulation.

Page 15, line 14: change “unit less” to “unitless.”

Page 15, bottom two paragraphs: As mentioned above, it would be interesting to discuss the opposing accumulation trends in terms of the PDO phase and/or the ASL deepening trend.

Page 17, line 27: Change “were, quality” to “were quality”

Figures 4 and 5: In contrast to figures 2 and 3, no significance levels are indicated on Figures 4 and 5. Could stippling for significance be added to Figures 4 and 5?

Figure 5 caption, page 23: should be “correlations...cover” or “correlation...covers.”

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