

Interactive comment on “Assessing the robustness of Antarctic temperature reconstructions over the past two millennia using pseudoproxy and data assimilation experiments” by François Klein et al.

Anonymous Referee #1

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This is an interesting paper that explores important issues (stability of oxygen isotope-temperature relationships) in a novel, thorough and systematic way. Given the challenges of reconstructing temperatures (and climate in general) over the Antarctic, this paper is a valuable step towards better reconstructions, and importantly understanding issues in developing these reconstructions and their uncertainties. The paper is well-written, in particular the conclusions as well as providing a strong summary of what has been found, points well to the implications of the findings, and what is needed to address some of the issues found.

C1

I therefore recommend acceptance subject to minor revisions, which I list below.

- 1) Abstract, line 3. Consider changing to ‘short and spatially sparse’ (or something like this) to reflect the issue that the instrumental records are limited in spatial coverage as well as temporal.
- 2) Page 8 line 33. You discuss that the choice of error has an impact on the results. Some more information on this would be useful (perhaps in supplementary information).
- 3) Page 9 line 20. You state that the CPS method means that more than half of the records are discarded. Giving the exact number here would be useful.
- 4) Page 9, line 33. Here and other places where you discuss trends/warming, consider including whether trends are significant.
- 5) Caption of Figure 1 needs rephrasing. It currently states ‘Last millennium 10-(left panels) and 5-year (right panels)’, but the right hand panels are not for the last millennium.
- 6) Caption of Figure 4, line 3, I think should state that the slope values are shown in green.
- 7) At the start of Section 5, a few sentences reminding the reader of the purpose of this analysis in this section would be helpful. Indeed, doing this at the beginning of each section would help the reader, as the analysis involves quite a few different components/data sources.
- 8) Small grammatical errors
 - Page 2 final line, change to ‘also adds to the challenge of the interpretation of ice core signals ‘
 - Page 3 line 26, change to something like ‘As our study is based on model results. ...’

C2

- - page 4 line 1, change to 'consist of using climate model...'
- Heading of section 2.2. Change to 'Water stable isotope records'
- page 9, subheading 2.5, change to 'Statistical reconstruction methods' - Page 11 line 16, change 'backyard' to 'backward'
- Page 17 line 19, change to 'there are no fundamental inconsistencies'.
- Caption of figure 8: line 8, change to 'measurements of Orsi et al. (2012). Line 11, rephrase to something like 'The reconstructions based on instrumental records by Nicolas and Bromwich (2014)...'
- Page 26 line 16, change to 'data assimilation always provides reconstructions'
- Page 27 line 6, change to 'Consistent with the results of the pseudoproxy experiments...'
- Page 27 line 26, change to 'to help distinguish the forced response from natural variability'.

Interactive comment on Clim. Past Discuss., <https://doi.org/10.5194/cp-2018-90>, 2018.