The Cryosphere Discuss.,
https://doi.org/10.5194/tc-2018-161-RC3, 2018

The Cryosphere Discussions

Interactive comment on "Stable water isotopes and accumulation rates in the Union Glacier region, West Antarctica over the last 35 years" *by* Kirstin Hoffmann et al.

Anonymous Referee #3

Received and published: 2 December 2018

This manuscript presents a new dataset of stable water isotopes and accumulation rates from firn cores in the Ellsworth mountains at the northern edge of the West Antarctic Ice Sheet for the period 1980 – 2014. As measurements at the intersection between the Antarctic peninsula, the West Antarctic Ice Sheet and the East Antarctic Ice Sheet are particularly sparse, this new dataset is an important contribution toward a better understanding of climate variability in this region. I see the value of the manuscript therefore primarily in the publication of this dataset, while the accompanying meteorological analysis is limited. This is acceptable, as the dataset itself deserves a publication, but I recommend minor revisions before final publication.

General comments

The drilling and measuring process is nicely explained, but I miss details on the trajectory analysis. Where did you start the trajectories from (lat/lon/lev), and how many per precipitation event (I hope more than one)? Also three days might not be enough, and the origin of the trajectories does not always reflect where the moisture comes from, because some trajectories could be very dry and not contribute to precipitation at all. I suggest using the moisture source diagnostic from Sodemann et al. (2008), which is also based on backward trajectories, but specifically identifies moisture uptake regions.

Referring to the lack of correlation between the firn core data set and local ERA-Interim data, you speculate that either the model is unable to capture the orography of the Ellsworth mountains or this is evidence of post-depositional processes at the firn core sites. You could get a better idea which of the two is the case by correlating local ERA-Interim data with the two weather stations near the firn core sites.

Looking at Table 3 and the discussion, there are barely any significant correlations between the isotope signal / accumulation rates and the other variables, meaning that there must be other factors influencing their variability. It would be nice to have some discussion on what these factors could be.

Specific comments

Page 5, line 23: Please explain the terms standardized and non-standardized, and why you use both (why not only standardized).

Page 5, line 28: Introduce abbreviation AWS

Page 7, line 8: "t" missing in "the".

Page 7, line 23: Could you explain what you mean by that? Meteoric as opposed to what?

Page 9, line 29: Fig. 9b instead of 9c.

Page 9, line 32: “a significant correlation” instead of “a correlation”.

Page 11, line 20: Fig. 9c instead of 9b.

Page 11, line 21: “Similar results have been found” instead of “Similar has been found”.

Page 12, line 14: Delete “are”.

Fig. 5: For completeness, please explain what the red dashed line and the dots show.

Fig. 6 and 7: Since the timeseries all have the same units, it might be possible to show them all in one plot (with one y axis) using different colors for the different sites. In this way it would be easier to compare them.

Fig. 10: Please add numbers to the colorbar. Why the irregular spacing?

Table 1: Why only δ18O for the period covered by all cores?

References

Sodemann, H., C. Schwierz, and H. Wernli (2008), Interannual variability of Greenland winter precipitation sources: Lagrangian moisture diagnostic and North Atlantic Oscillation influence. J. Geophys. Res., 113, D03107, doi:10.1029/2007JD008503

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