

## ***Interactive comment on “Challenges associated with the climatic interpretation of water stable isotope records from a highly resolved firn core from Adélie Land, coastal Antarctica” by Sentia Goursaud et al.***

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The paper provides a detailed and thorough examination of stable water isotopes and snow accumulation and chemistry from a shallow (21.3m) ice core in coastal Adélie Land. The record covers a relatively short time (1998-2014), but demonstrates the importance of robust proxy evaluation, particularly at coastal Antarctic sites.

I have a few minor comments and suggestions:

P2 Abstract – There is quite a bit of detail about the method in the abstract, which I felt

C1

was not necessary. Removing lines 7-13 will keep the abstract concise and focus more on your findings. P2 Line 16 - End sentence after "...timescale."

Introduction The recent PAGES 2k compilation of ice core snow accumulation data (CP, 2017) highlighted the importance of coastal records.

There was no mention of the Antarctic Peninsula in your summary of drilling efforts at coastal sites? Several shallow, low elevation coastal cores have been drilled in this region.

Climatic interpretation of water stable isotopes records – I felt some reference to previous studies on the role that sea ice plays was missing. I suggest checking the following:

Noone, D., and I. Simmonds (2004), Sea ice control of water isotope transport to Antarctica and implications for ice core interpretation, *J. Geophys. Res.*,109, D07105, doi:10.1029/2003JD004228.

Bromwich, D. H. (1988), Snowfall at high southern latitudes, *Rev. Geo-phys.*,26, 149–168.

Bromwich, D. H., and C. J. Weaver (1983), Latitudinal displacement from main moisture source control of  $\delta^{18}O$  of snow in coastal Antarctica, *Nature*,301, 145–147.

P19 Line 23 – remove “does” P21 Line 12 “On average,..”

Discussion

The PAGES 2k compilation, based on ice cores and modelled SMB from RACMO2.3p2, identified a negative trend in SMB in neighbouring Victoria Land. The negative trend since the 1960s is statistically significant ( $p < 0.01$ ) and outside the expected range for the previous 200 years. A negative trend was also identified in the Wilkes Land coast (of which your Adélie land site would fit) which was outside the range of expected variability but not statistically significant.

P23 Line 5-7 Consider rewording "...we observe slightly increasing but not significant

C2

trend in the TA core, era and ECHAM5-wiso records”.

P24 Reference to other d18O temperature records. Poor correlations with temperature observed in the Antarctic Peninsula and coastal west Antarctica. For example, the relationship between d18O and temperature from ERA-interim at a coastal site in Ellsworth Land (Ferrigno) was 0.44 (p 0.01). At this site the relationship between d18O and temperature was similar to that of the relationship between d18O and sea ice conditions ( $r = -0.37$  between d18O and winter sea ice extent and  $r = -0.54$  between d18O and sea ice concentration).

P25 Line 3 – Should this line be a section heading? P25 Line 20 – Consider rewording – “As discussed earlier, this last item should be considered with caution due to potential numerical artefacts.”

#### Chemistry

P28 Line 16 – There have been several studies suggesting that sea ice is a source of sea salt aerosols, therefore the presence of summer sea ice might not be associated with reduced Na? It might be worth checking or acknowledging these papers.

See Yang, X., Pyle, J. A., and Cox, R. A.: Sea salt aerosol production and bromine release: Role of snow on sea ice, *Geophys. Res. Lett.*, 35, L16815, <https://doi.org/10.1029/2008GL034536>, 2008.

Rhodes, R. H., Yang, X., Wolff, E. W., McConnell, J. R., and Frey, M. M.: Sea ice as a source of sea salt aerosol to Greenland ice cores: a model-based study, *Atmos. Chem. Phys.*, 17, 9417-9433, <https://doi.org/10.5194/acp-17-9417-2017>, 2017. (admittedly the later is for Greenland).

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Interactive comment on The Cryosphere Discuss., <https://doi.org/10.5194/tc-2018-121>, 2018.