

Review of a manuscript for *Climate of the Past*

Varying regional d18O–temperature relationship in high resolution stable water isotopes from East Greenland by Holme et al.

Overall:

In this manuscript the authors demonstrates a time dependent correlation of a stack of three forward-diffused d18O records from Renland ice cap with a series of longer temperature records from the Greenland region. The authors relate a lack of correlation for the pre- 1910 period with the increased sea ice extent in the Greenland and Iceland seas (more precisely, Fram Strait sea ice export) and sea ice effects on moisture pathways/ distillation histories.

In general the paper is clearly written and results are well presented. My only moderate concern is related with the use of index based sea ice export reconstruction as a sole indicator of sea ice anomalies in the Greenland and Iceland seas. From the point of view of direct physical controls on the local d18O in precipitation, these are sea ice extent anomalies along the moisture pathways that are the more obvious candidates rather than sea ice export which integrates extent together with other relevant variables (drift velocity, spatial ice thickness distribution etc). The authors already refer to Noone and Simmonds that discusses the driving mechanisms for sea ice extent - d18O relationship. Therefore in addition to the reconstruction of Schmith&Hansen, the authors may consider using seasonal ice extent anomalies from Divine&Dick (2006), doi:10.1029/2004JC002851, directly, the data are found in <https://nsidc.org/data/g02169>.

In general, the manuscript deserves to be published after these moderate modifications to the content if the authors/editor finds them relevant. Some stylistic corrections are also suggested in the list of minor comments.

Minor comments

Page 1 line 3:

“d18O variability actually reflects....” Please refer to d18O in precipitation or mention posdepositional alterations if one refers to the d18O profiles measured in ice cores.

Page 1 line 16: “...and the sea ice export anomaly is...” FS sea ice export anomaly in my opinion should in this study be used as an indicator/proxy of sea ice extent anomalies in the Greenland/Iceland seas. Therefore, some corrections to the text that emphasizes this point would be required.

Page 2: Relevant for this study is a recent publication by Munch and Laepple (<https://www.clim-past.net/14/2053/2018/>) showing the timescale dependent SNR estimates for some Antarctic ice cores.

Page 2 line 11 “Changes in the atmospheric circulation can be triggered by climatic oscillation modes...”. Consider reformulating this statement to something like “changes in regional

quasistationary modes of climate variability such as NAO can modulate (influence) global atmospheric circulation patterns”

Page 3 line 1, ref to map Fig 1. I would suggest to add an inset with a more detailed map of the peninsula with the core locations.

Page 3 line 5 “Inland ice”, is it really needed to use a capital letter?

Page 4, Caption figure 1. Change to something like “...black arrow indicates a primary direction of sea ice transport from the Arctic via the Fram Strait.

Page 5 line 15 “...where the fraction rho... ultimately is multiplied...” multiplied by what? Please be specific or reformulate the sentence, it is not clear now.

Page 7 line 14. Adding a reference to a classical work of D. Fisher here would be highly relevant too: https://www.igsoc.org/annals/7/igs_annals_vol07_year1985_pg76-83.pdf

Page 8 line 10 “...it is beneficial to combine the time series into a stacked record...” This was demonstrated earlier a number of times and probably can be considered trivial at this stage.

Page 9 line 11-13. I would suggest to move the links to the temperature series to supplementary, if proper data citations are not available.

Page 11 line 10 “...in said period” change to “indicated” or “studied” period?

Page 11 Line 11 “decorrelation scale of this d18O-temperature relationship...”. Not clear what “decorrelation scale” means in this context. Please specify.

Page 12 Line 19 “The NAO describes...” Consider changing to “it can be described/approximated using the SLP difference between...”. One can also improve the flow by swapping the first two sentences of section 7.

Page 13 line 4 “...said correlation...” consider revising

Page 13 line 6 “...multiple sea level pressure records..” or gridded datasets of SLP/GPH

Page 14 line 17. I recommend authors to refrain from referring to a specific class of ice (MYI) in the manuscript. Fram Strait ice export from the Arctic features both multi- and first year ice components. Note that some ice undoubtedly forms in situ too.

Page 15 line 1. Authors are recommended to be critical regarding the quality of SIE reconstruction prior to 1900 when the original historical data density and quality gets progressively lower. It may to some extent explain lower correlations for the pre – 1900 period.

Page 15 line 12 “...warm temperatures result in less sea ice that can be exported away from the Arctic.. ” and less ice formation locally

Page 15 line 14 "...uncorrelated d18O-temperature relation..." consider changing to "indicates that a lack of correlation between..."

Page 15 line 18 "...correlation hiatus..." not sure if the use of "hiatus" is correct here.

Page 15 line 20 "...only every 5 point is used..." is the analysis sensitive to the choice of the starting point for the sequence?

Page 15 line 24 "...less multiyear sea ice..." see my earlier comment

Page 15 line 31. In terms of sea ice variability, May is considered largely a winter month

Page 19 line 5: "...precipitation has journeyed further..." better refer to a longer distillation path/trajectory

Page 19 line 22 "correlations stopped in the..." "diminishes"?

Page 20 line 2 "...a vapour mass experiences (en route) from..."