

## ***Interactive comment on “Climate information preserved in seasonal water isotope at NEEM: relationships with temperature, circulation and sea ice” by Minjie Zheng et al.***

### **Anonymous Referee #1**

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Zheng and co-authors are presenting a climate data analysis using  $d_{18}O$  records obtained from four shallow firn cores resolved at seasonal resolution drilled at the NEEM Greenland site. They investigate the  $d_{18}O$  summer and winter signals, following a previous approach used by Vinther et al (2010) in southern and central Greenland for extracting them. They correlate the seasonal signals to observed meteorological temperatures (summer and winter) recorded in NW and SW Greenland, to twenty century re-analysis data set (20CR), to previously obtained seasonal isotopic records from central and southern Greenland and their PC1, to the NAO and AMO indices. They found that the summer  $d_{18}O$  is a better temperature proxy due to a higher snow accumulation rate during summer at NEEM compared to other central and southern Greenland sites.

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Moreover, they found a good correlation between winter  $d_{18}O$  and sea ice concentration in the Baffin Bay. This last correlation between  $d_{18}O$  and sea ice was already suggested by Steen-Larsen and co-authors in a previous paper in 2011 for the same NEEM site but based on interannual variability. However, in this paper, Zheng and co-authors are using for the first-time NEEM seasonal isotopic data rather than mean annual values.

The main outcomes of this paper, the annual  $d_{18}O$  dominated by a summer signal at NEEM, the weak influence of NAO and a sea ice climate control during winter compared to other Greenland sites, have important implications for the climate interpretation of the NEEM deep ice core.

The paper is interesting, quite concise, well-structured and the topic is appropriate for Climate of the Past. Nevertheless, the authors should consider some minor comments reported below before resubmitting a revised version.

Page 2, line 62: “... 16 annual resolved ...”: is this number 13 or 16?

Page 6, lines 207-208: may you expand a little this part, explaining briefly the methodology used here?

Page 6, line 110: “...windier conditions and less snow accumulation rate.” Are you referring here to wind redistribution phenomena? And/or wind erosion?

Page 6, line 215: comparison with other Greenland ice core records: are there any data from NGRIP? Never mentioned ...

Page 9, lines 320-323 and then 325-327: may you explain better here, not clear what you want to say. I do not understand the two different hypotheses.

Page 17, Figure 3: this figure is hardly readable. I would suggest improving it.

Page 18, Figure 4: please add the reference for the data shown in the panel c and d.

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