

## ***Interactive comment on “Eurasian Arctic climate over the past millennium as recorded in the Akademii Nauk ice core (Severnaya Zemlya)” by T. Opel et al.***

**N. Abram (Referee)**

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Received and published: 23 July 2013

Overall, this is a very interesting new ice core record for the Arctic. I think that the paper will be suitable for publication in Climate of the Past, but the work does first require some revisions to clarify and fully justify the main points being made.

Please note, that as editor on this paper I am submitting this review because the second reviewer has not completed a referee report yet and I think that it would be best to keep progress on this paper going forward rather than waiting longer or seeking out a new referee. I would now ask you to look over my review comments as well as those of the first reviewer and proceed with preparing a revised manuscript and response to the

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reviewers comments.

Sincerely, Nerilie Abram

Main points:

Na/sea ice discussion: The use of Na as a sea ice/circulation proxy could be better developed and needs to be supported by references. For example: page 2409, line 12 onwards – the use of increased Na to reflect lower sea ice near this location needs some evidence to support it. Also, in figure 5 it would make more sense I think to compare the Kinnard sea ice reconstruction to the Na record which is being used as a proxy for sea ice. Perhaps to avoid confusion the Na-T comparison and comparison to Kinnards sea ice reconstruction could be grouped together as a separate panel at the bottom of this figure (i.e. keep the temperature proxies together and the sea ice proxies together)

Trends vs multi-decadal variability: It would be good if the text could be made clearer regarding discussion of multi-decadal variability vs long term trends. E.g. page 2409, line 25: it is the multi-decadal variance that appears to come out of “strong accordance”, the long-term pattern still looks similar I think – are there some correlation statistics that you could use to back this up? Also, the paper would benefit from statistics to back up some of the main points. For example, page 2411, starting at line 12: what is the “dominant range” in your record, by what statistical measure do the anomalies in the 15th, 16th, 18th and 20th centuries exceed it by?

ETCW and 1800 minimum: The discussion of these features is quite prominent in the manuscript, but I feel that they could do with more clarification/exploration and also illustration in an additional figure. For example: some mention is made to leads/lags between sea ice and temperature. How significant /certain are these relationships? Also, is it possible to plot the Meeker and Mayewski data for the Icelandic low/Siberian High reconstruction alongside the new ice core record to help support the interpretation that this meteorological change can explain the abrupt changes in your record. It would

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also be helpful for people who aren't so familiar with the climate features in this area if you could have a map/schematic/spatial correlation plot, or something along these lines, to show how these features influence the climate at your ice core site.

Comparison to Arctic reconstructions: it would be good to bring in the new PAGES2k synthesis (Nature Geoscience 2013, May). Also how different is the more recent Arctic temperature reconstruction in that paper compared to the 2009 one? Page 2412, Line 5 onwards: does this interpretation still hold with the newer Arctic reconstruction? Are the difference a robust feature, or are they within the range of noise and chronological uncertainties within the Arctic reconstruction? Also, to aid discussion of differences related to geographical distribution, would it be possible to add symbols to the map showing where the records for the Arctic synthesis come from?

Minor:

- It would be good to provide some additional site information (e.g. temperature, accumulation)
- Page 2407, line 16-20: this sentence is quite long and difficult to follow
- “peculiarity”, in some instances might be better phrased as “localized feature” or something similar that is more specific for the feature that you are discussing.
- Page 2407, line 20: Can you elaborate on why/how it indicates a strong Atlantic influence?
- Page 2409, line 1: how much elevation change would be needed to explain the long term trend? How likely do you think it is/what other evidence is there that this is influencing the trend, particularly given that it seems to be a consistent feature across many Arctic records?
- The Lomonosovfonna record is mentioned in the text but is not shown in the figures. It would be good to include this so that readers can visualize the differences that are mentioned in the text.

- Page 2410, line 20: this sentence was difficult to follow. Do you mean "...sites as being distinctly different to SAT patterns in the North American Arctic."?

- Table 1: it might be better to separate out into separate columns the raw and de-trended correlation values, I found the use of brackets to denote this different to be a little confusing at first.

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Interactive comment on Clim. Past Discuss., 9, 2401, 2013.

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