

## ***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.***

### **Anonymous Referee #1**

Received and published: 19 June 2013

Overall In this paper the climate record from the upper 411 m from a 724 m deep ice core from the Akademii Nauk Ice Cap on Severnaya Zemlya is presented and discussed in terms of mainly temperature and sea ice variability. The core has been dated to cover the period between AD 900 and 1998.

There is generally very little paleo-data available from this part of the Arctic so therefore this paper is of particular high interest from that aspect. In the light of the dramatic changes that we are now seeing in the Arctic proxy-climate records like the Akademii Nauk ice core are extremely valuable in order to improve our understanding of the different processes and dynamics being important for the Arctic climate.

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I consider the Akademii Nauk ice core being well-dated and very suitable using for various paleo-climatic studies. Despite the fact that the ice core is retrieved from an ice cap with seasonal melt and thus has the potential of melt-water infiltration, the annual layer counting has been possible using high-resolution stable isotope data differencing single years using  $d_{18}O$  and  $dD$ . In addition detectable peaks from nuclear bomb tests and several well-known volcanic eruption ensures that the dating error is within the  $\pm 5$  year limit. Specific details around the dating is not presented in this paper because it has been discussed in previous published work in Journal of Glaciology in 2009. However, since dating of cores from lower elevation ice caps is often the issue that many in the scientific community are particularly concerned about I suggest including a figure showing examples of the  $d_{18}O$  stratigraphy in detail- also for deeper layers.

The paper clearly suffers from poor language which makes it sometimes hard to understand. Therefore, it is very important to focus on improving this.

In summary, the paper includes important data but presentation is not the best.

### Specific comments

#### Abstract

The first sentence is not a good introductory sentence to the abstract. In fact, the text in the abstract does not reflect or give justice to the content of the paper. It should be rewritten.

#### Introduction

p. 2404, line 11.

#### Methods and data

This is a very brief chapter and does not include all the necessary items. I think that the meteorological data should be presented here. Why has not the whole core been analyzed?

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## Ice core dating

2405 line 14-19. “For an independent annual-layer counting we used the seasonal signals of the high-resolution stable-water isotope data”. Because major conclusions are based on the annual resolution and I think that the reader should get to see an example of what that looks like, i.e the d18O raw data. This is not shown in Opel (2009) either. . . .

Also I wonder if annual layers were detected throughout the 411 m upper core? I would be very curious to see what it looks like at 400 m compared to the upper core part. . . .

2406 line 5-10. This makes the reader curious about the lower part of the core. Have there been any preliminary analyses done that support the statement “ might be a remnant of an older, but post-glacial ice-cap stage” ?

## Results and discussion

In this chapter the language makes it more difficult to follow. Sentences are in many cases constructed in a very complicated way. It will benefit greatly from being rewritten. Below are a number of examples- but there are many more. . . .

2407 line 14. weaker than those reported. . . .

2407 line 18 different elevations. Actually the whole sentence line 16-20 would benefit from being rewritten- it is very long.

2407 line 21. Remove “this area”, it is enough with the “the Barents and Kara seas region”

2407 line 23-24. Remove “and less maritime”

2407 line 27. The expression chosen here “climatic fluctuation” does not describe that this is actually a warming.

2408 line 2-6. Complicated sentence with many commas

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2408 line 7. Please specify “these processes” when you start a new paragraph

2408 line 7-15. “peculiarity” is not the best choice of wording here. Please rewrite these sentences.

2408 line 16-23. This paragraph does not fit into the topic of this chapter. There is a very abrupt transfer to the sodium record from  $\delta^{18}\text{O}$  without much introduction. Please delete or rewrite and move to p. 2409 where you discuss the sodium record more.

2409 line 4. “too” looks wrong here. Please rewrite, maybe using “in addition” instead.

2409 line 8. I assume that you with “ $\delta^{18}\text{O}$  derived temperature” mean the proxy temperature and not a reconstructed temperature. Maybe best to specify so that there is no misunderstanding.

2409 line 9. I think that the use of the sodium records as a sea ice proxy needs/deserves a little better introduction here. I recommend starting a new paragraph.

2410 line 10-12. Something is wrong here. Please rewrite sentence.

2410 line 20-25. This seems quite speculative so I suggest expanding text a little more. Exactly what is the meteorological data showing?

2410 line 27. This statement should either be supported in this paper or have a reference to Opel et al., 2009.

2411 line 23-26. You mean “no similar” pattern? Please rewrite

## Figures

I suggest to replace the running mean with a more robust and better –suited low pass filter which will not “re-place” the peaks.

The figures with the time series would benefit from having denser tick marks at least

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for the time (x-axis).

Fig. 4. Please merge panel A and B to one since they are showing the same variability.

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

**CPD**

9, C1172–C1176, 2013

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