

## ***Interactive comment on “Holocene sub centennial evolution of Atlantic water inflow and sea ice distribution in the western Barents Sea” by S. M. P. Berben et al.***

### **Anonymous Referee #2**

Received and published: 11 October 2013

The paper presents a new multi-proxy data of surface and subsurface water conditions as reconstructed from the Holocene section of a marine sediment core from the western Barents Sea margin. The new results are discussed in relation to relevant literature, however, it is in general not clear what the authors preferred interpretation and explanation is, or why. This information needs to be added to the manuscript. Furthermore, there is a huge potential for shortening the text and clarifying the message told. The authors should go carefully through the full manuscript with the aim to get a more focused, shorter and clearer text. The scientific content of the paper is ok, however, since the manuscript needs quite a bit of work to make it easier to read and present a clear message I will conclude that the paper needs major revision.

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## Abstract:

General: Clarify the main message of the paper through the discussion and conclusion, and let it be reflected in the abstract.

Line 1-10: Rephrase. Suggestion: A marine sediment core from the Kveithola Trough at the western Barents Sea margin, JM09-KA11-GC, is investigated. Planktic foraminifera, stable isotopes and biomarkers from sea ice diatoms and phytoplankton is analyzed at centennial resolution in order to reconstruct subsurface temperatures and sea ice distribution. The relation between past variability of Atlantic water inflow and sea ice distribution is discussed.

Line 6-8: Delete.

## 1 Introduction:

General: The introduction is very long, and it can be better structured. A lot of information is given, however, it is still not clear what the aim of this paper is, except from presenting new data. Why is these data important? What do they add to the current knowledge? What research questions do you want to address?

Page 4894, line 24-26: Suggestion: During summer 2012 the Arctic sea ice extent reached its minimum extent within the 30 yr record of satellite sea ice observations (Schiermeier, 2012).

Page 4894, line 26 and page 4895, line 1-4: Merge and rephrase.

Page 4895, line 8-9: Delete.

Page 4895, line 11-13: Delete or rephrase. The sentence does not make sense as it is now.

Page 4895, line 16: Include reference.

Page 4895, line 16-19: Delete here. The information should be found in section 2 of

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the paper.

Page 48-95, line 19-21: Overlaps with the first sentence of the paragraph.

Page 4895, line 28 – page 4896, line 10: Take into consideration information gained by newer studies, e.g. by Andersson et al., 2010 and Risebrobakken et al., 2011, papers and information that you refer to later in the manuscript.

Page 4896, line 10: New paragraph.

Page 4896, line 13-17: What about other suggested mechanisms behind millennial scale changes through the Holocene? And, the sentence needs to be rewritten. Also check e.g. Marshall et al., 2001 and Orvik and Skagseth 2003. Atmospheric forcing does influence the large scale and regional ocean circulation.

Page 4896, line 20-26: Suggestion: The precise nature and driving forcings behind variability in Atlantic water inflow and sea ice extent through the Holocene are discussed. In order to determine the degree of variability and understand the mechanisms at play, more well-dated, high resolution records are required. Could potentially be moved to the end of the introduction, and lead to the aim of your study.

Page 4896, line 27 – page 4897, line 5: Not relevant for the introduction, should be moved to method and/or discussion.

Page 4897, line 6 – page 4897, line 23: Most of this information does not belong in the introduction.

Page 4897, line 24 – page 4898, line 3: make sure that it is clear what the aim of the paper is, why, and how you will address it.

## 2 Study area

General: I suggest that you rename this section and call it Oceanography instead of Study area, since what you actually do is to introduce the oceanographic setting of the whole region.

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Page 4898: Between paragraph 2 and 3 there is an unclear transition when you jump between the Nordic Seas and Barents Sea conditions.

### 3.1 Chronology

Page 4900, line 16: Give accumulation rate in cm/ka not mm/year. Or provide information on the final resolution of your records in years/cm.

Table 1: You do not believe in those mollusc dates that do not fit with your preferred age model. Why should the other mollusk dates be more reliable?

Figure 1A: Include the omitted ages in the figure.

### 3.2 Planktic foraminifera

Page 4901, line 2-5: Consider specifying in the figures (e.g. by using different colors) which of the samples that has less than 300 specimens counted.

### 4.2 Stable isotope analysis

Even though the main trends in the d18O and d13C are the same, the information given by the two records are different. I recommend that you restructure the information into two paragraphs, one relating to d18O and the other to d13C.

### 5 Discussion

General: Throughout the discussion information should be added to make it more active, interesting and relevant. It is said what your data shows, and what is seen in literature. However, when you refer to different theories to explain the observations, you should also conclude on what your preferred interpretation is, and argue for why. Also include a summary at the end of each subsection, giving your main message for the relevant time interval. Presently, your contribution drowns in a literature review. Furthermore, make sure that it is clear how the information from the literature fits, or don't fit, with your data and interpretations. This is done some places, but not consistently.

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Page 4908, line 1-3: The planktic foraminiferal fauna is dominated by NPS, which is . . . . The high relative abundance of NPS (60%) agrees well with. . .

Page 4908, line 5-8: These studies are done at different size fractions, hence the absolute values might not be directly comparable.

Page 4908, line 14: . . .(CCD), hence, the dissolution . . .

Page 4910, line 17-18: Merge to one paragraph.

Page 4911, line 21: Andersson et al., 2010, not 2009.

Section 5.2: This section contains a lot of unclear sentences. One example is from page 4912, line 19-21, but there are more. The first paragraph is very long and the message is not clear. There is a need to clarify the text, and co-authors should be able to help with that.

Page 4912, line 11-17: Can the selective dissolution have potential implications for the calculated temperatures?

Page 4912, line 18: Increased early-mid Holocene  $\delta^{13}C$  (relative to what?) indicates better ventilated surface water, and/or enhanced primary production (Fig. 7f).

Page 4912, line 24-26: Can you really say that the seasonal sea ice cover progressively decreased? The IP25 signal tells you that you had spring sea ice at the site, but can the concentrations actually tell if it was more or less?

Page 4913, line 9: These changes – specify what changes. In what direction did the front move?

Page 4913, line 1424: Merge the information given in these two paragraphs. And take a more active role in the discussion; your opinion is not clear.

Page 4914, line 7: Andersson et al., 2010; Risebrobakken et al., 2011

Page 4914, line 10-12: Depending on your preferred interpretation of TQ? As men-

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tioned in first and second paragraph of this section, it can be influenced by Atlantic water/marginal sea ice zone and Arctic front.

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Interactive comment on Clim. Past Discuss., 9, 4893, 2013.

**CPD**

9, C2316–C2321, 2013

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