

## ***Interactive comment on “Reconstruction of Atlantic Water variability during the Holocene in the western Barents Sea” by D. E. Groot et al.***

### **Anonymous Referee #2**

Received and published: 22 September 2013

This paper presents Holocene variability of Atlantic Water inflow in the western Barents Sea. The presented data demonstrate nicely the usefulness of shelf records in order to pursue the understanding of climate variability. The quantitative temperature reconstruction of the bottom waters in this study is a new input to otherwise detailed datasets existing from the Barents Sea region. The topic, data and the methods presented merits publication in Climate of the Past.

Still, I have quite a few issues and comments that need attention before the paper can be accepted for publication.

The authors have the unique advantage of paired samples of  $\delta^{18}\text{O}$  and estimated transfer function bottom water temperatures. Thus, offering the opportunity to calculate the ambient  $\delta^{18}\text{O}$  of seawater ( $\delta^{18}\text{O}_{\text{sw}}$ ). I therefore ask if the authors have

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considered calculating the  $\delta^{18}\text{O}_{\text{sw}}$  and compare for example to the transfer function estimated salinity. According to the core location, in close proximity to the Arctic front, water mass properties such as salinity is expected to vary during the Holocene. Could the Holocene  $\delta^{18}\text{O}$  signal be more influenced by salinity changes than previously believed? In any case, temperature reconstruction using benthic foraminifera transfer functions in conjunction with  $\delta^{18}\text{O}_{\text{calcite}}$  - enabling the calculation of  $\delta^{18}\text{O}_{\text{sw}}$  - would be a step forward.

Did the authors consider the use of statistical programs (e.g. MultiVariate Statistical Package or Regime Shift Detection) to confirm your division of Holocene into different sections? With for example cluster analyses the down-core data can be divided into foraminiferal assemblage zones. This would help writing up the results and help the reader to follow up on your data description.

The present day bottom water temperature and salinity at the core site is nicely shown on figure 5. Consider also including it in the text, especially the difference in present day salinity and estimated values for the site today. Does it fall within the error bars of the transfer function reconstruction?

The authors refer to other studies from the region and even from the same core. Could the most important comparison data be plotted along with the results? That would help the reader to follow the interpretation, which often turns out to be confirmation of previous findings (which at times made me wonder: What is the step forward with this paper?).

The retreat of the Arctic front is quite important. What is the timing of the marginal retreat? That is an important conclusion also in comparison to other records in the region.

In section 5.2 it is a bit hard for the reader to follow, it might help if presented in chronological order (the authors take the reader a bit back and forth in time).

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I thought it was confusing that the different proxy results (interpreted in section 5.2, 5.3, 5.4 - see below) were all explained with stronger inflow of Atlantic Water (consider other explanations or differentiate from faster flow of the current and warmer temperatures in the current, does that always hold hands - intensification with or without getting warmer):

5.2 “A stronger inflow of Atlantic Water in the Early Holocene. . .”

5.3 “. . .due to the strengthened and constant inflow of Atlantic Water” (Can it be both strengthened and constant? Do you mean constantly strengthening inflow?)

5.4 “. . .due to a stronger inflow of Atlantic Water at the western Barents Sea margin.”

Different timing of the onset of the late Holocene cooling in the region is introduced in the 3rd paragraph in section 5.4. Could the authors please discuss the reason for that?

In conclusions the terms polar and subpolar fauna are introduced for the first time. Consider giving an example earlier in the manuscript of polar and subpolar fauna.

In the manuscript the authors talk about “distribution patterns of benthic foraminifera.” My understanding of distribution pattern is when referred to a study of how the foraminiferal species are distributed in a specific area (e.g. comparing surface cores). Please consider to add “down-core” distribution patterns or use “the diversity of benthic foraminifera.”

The paper reads better if the verbs are always in the same tense. Please be consistent throughout the manuscript, for example in results; the sedimentological section is in present but the foraminiferal section is in past and then again the stable isotope section is in present.

The English in the manuscript could be improved, several minor grammar and spelling errors occur.

Figures:

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Figure 3: It is difficult for the reader to see which curve is the flux and which is the concentration, please clarify. The authors could clarify figure text by identify panels with A, B, C. Number of species/samples is introduced in a wrong order.

Figure 4: Please consider using transparent color (or lighter tone of gray color), because data is lost behind the black curves.

Figure 5: It could be helpful to zoom into periods of interest, for example zoom into the last 10.000 yrs BP to better outline the variability in the dataset.

Figure 5: A 5 point mean of the data set is plotted (does the dataset need to be presented with lower resolution?). What does the 5 point mean add to the interpretation/conclusion (is the transfer function estimated values and the  $\delta^{18}\text{O}$  values not with the same sample resolution?).

Please consider including error bars on the transfer function estimates in figure 5.

In figure 5  $\delta^{13}\text{C}$  is plotted. If it is presented please include in results. Beside from the method section it is only mentioned once in the manuscript (one sentence in second paragraph in section 5.4). Consider what it adds to the presented study.

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Interactive comment on Clim. Past Discuss., 9, 4293, 2013.

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