Clim. Past Discuss.,
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Climate of the Past Discussions

Interactive comment on "Surface and subsurface Labrador Shelf water mass conditions during the last 6,000 years" *by* Annalena A. Lochte et al.

Annalena A. Lochte et al.

annalena.lochte@ifg.uni-kiel.de

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Thank you very much for the positive and constructive feedback on our contribution. Below, we address the specific concerns raised by reviewer 2.

1. Add evidence of homogeneity (e.g. linescan images, CT scans, grain size)

We will provide colour scans and core photographs in the appendix.

2. Why was N. labradorica used? Refer to Barrientos et al. 2018. Why was the Barrientos calibration not used?

We will include a brief justification in section 3.4 as to why N.labradorica was used, adopting the wording of this referee: N. labradorica was chosen for Mg/Ca measure-

ments because as an infaunal species the bottom water carbonate ion concentration has been shown to have a limited influence and it has, in the Arctic, been deemed a suitable recorder of Mg/Ca in shelf regions (Barrientos et al., 2018)

We decided not to use the calibration of Barrientos et al. because their data (n=7) are from areas with BWT of less than 0°C, i.e. far below the BWT observed in our study area. In a forthcoming study, we will present new Mg/Ca data of N. labradorica from the Labrador Sea that support the calibration of Skribekk et al. used here.

Add depth intervals of samples >4°C (35%)

See response to (4) below.

3. Chronology: State the time interval the core covers (including the +/- for topmost and lowermost age constraints)

This information will be added.

4. Discussion section 5.1: It could be stated again here when discussing BWT that the temperature inversion occurs at the interval in which Mg/Ca estimates are less accurate and should thus be treated with caution (> 4 degrees C).

Rather than adding this statement to the discussion, we will include the following justification to 'material and methods', following line 8 on page 6: "... As the calibration is based on a temperature range of 1 – 4°C, estimates exceeding 4°C may be less accurate, which is the case for about 35% of the samples reported here. As a result, we refrain from interpreting individual data points exceeding 4°C. However, given the consistency of average Mg/Ca values for different sections of the core, we are confident in our interpretation of changing average BWT for specific time intervals (see 5.2.3 below)

5. p 9 line 1: Is Disko Bugt technically Baffin Bay?

This is correct. We will change the wording to "along the eastern coast of Greenland".

6. p. 9 line 10: Fig. ref should be 6e, f and g?

Correct, this will be changed.

7. p9: line 22: in the Moros et al (2016) paper is this not clearer in the dinocyst species (I. minutum %) rather than diatom species at this time?

The inversed plot of sea-ice dinocyst species I. minutum actually displays a decrease in abundance between 8 and 5.5 ka BP (Moros et al. 2016, Fig. 3), while sea-ice diatom species F. cylindrus indicates a minor increase in abundance at 6.2 ka BP, which we were referring to. However, we agree that this minor increase in F. cylindrus is not sufficient to suggest an increase in sea-ice cover at that time. Therefore, we will change the sentence to: "...they identified a severe drop in warm water benthic foraminifera species I. norcrossi, suggesting an abrupt subsurface cooling (Moros et al., 2016).

8. P. 12 line 28: "pachyderma"

This will be changed.

9. P. 12 line 29: Figure 6h

This will be changed.

10. P12 line 31: is this reference to cooling BWTs in the latter part of this interval?

P12, lines 26 - 32 will be changed to: "Episodes of an increased influx of Atlantic sourced water from the IC were also seen in the central Labrador Sea, indicated by decreases in the abundances of polar water planktic foraminifera species N. pachyderma sinistral (%Nps) at about 2.3 – 2.1 and 1.6 ka BP (RAPiD-35-COM; Moffa-Sánchez and Hall, 2017; Fig. 6h). These quite well correspond to the subsurface warming peaks in our record. Despite the generally warmer conditions in our subsurface water record during the last 2,100 years, the record displays a trend returning to colder temperatures in this interval. A general cooling trend after 2.2 ka BP is also evident in core RAPiD-

35-COM and has been linked to a weakening in LSW formation (Moffa-Sánchez and Hall, 2017).

11. P12 line 31-32: If the previous sentence is referring to cooling BWT temperatures this reference is to subsurface warming? It does not read to clearly and is also mentioned directly in the next paragraph.

We agree that this paragraph is a bit confusing. We now refer to both, a general cooling trend after 2,100 years BP, which is also evident in Moffa-Sanchez and Hall (2017), as well as short episodes of warming observed in our BWT record (Fig. 6g) and in decreases of %N. pachyderma (Fig. 6h).

12. P13 line 7: define DWBC as this is the first time it has been mentioned

“Deep Western Boundary Current” will be added.

13. P13 line 30-31: are there any reconstructions of LSW formation that could be shown on e.g. figure 6?

Unfortunately, no direct reconstructions of LSW formation exist for this period. Therefore, Fig. 6 shows the Irminger Current reconstruction of Moffa-Sanchez and Hall (2017), as circumstantial evidence of LSW formation. Furthermore, following the suggestion of another reviewer, a Mg/Ca temperature reconstruction from the Laurentian Slope (Marchitto & DeMenocal, 2003) representing the Deep Western Boundary Current (DWBC) will be added to Fig. 6 (see figure 1 below).

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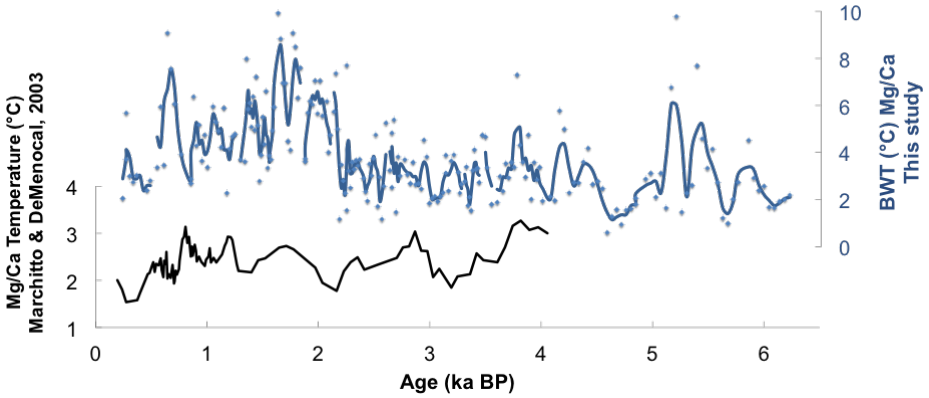

Fig. 1. Our BWT record plotted with an additional temperature record from the Laurentian Slope