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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.

Anonymous Referee #1

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This study present a paleoceanographic reconstruction of variability in the surface conditions of Labrador Current and changes to the influence from warm Atlantic waters on the subsurface bottom water temperatures over the last 6,000 years. Specifically, a sediment core from the Labrador shelf was analysed; alkenone analysis is applied to reconstruct surface conditions in the Labrador Current, while Mg/Ca measurements are provided to reconstruct the bottom water temperature. The data presented are of high quality given relatively high number of radiocarbon datings as well as the high sedimentation rate and sampling resolution allowing dense subdecadal time series. Moreover, the manuscript is very well written and well structured and the figures, discussion and conclusions easy to follow. I only have a few notions: A particular aim of the study is to assess the impact of Labrador Current variability on Labrador Sea deep-

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Discussion paper

water formation and a fine discussion of mechanisms linking the two is provided. It is found that overall the LC reconstruction here does not match Deep Western Boundary Current reconstruction from south of Newfoundland (Marchitto and de Menocal, 2003). The authors state that more deep water reconstructions are needed to resolve this. In this regard it would have been informative also with a figure of graphs comparing the LC reconstruction presented here with the additional LC reconstructions presented in the manuscript. This would highlight to what extent the surface reconstruction – based on alkenones – are representative of LC variability. Although, as also stated by the authors, similarity between these records (LC SST and DWBC) may reflect that the LC just respond to the same atmospheric forcing that controls deep-water formation, it would still be interesting to understand better exactly how well these data compares to previous LC data from the wider region.

I am not an alkenone expert, but I appreciate the precautions taken in the interpretation of the data, including the caveats associated with C37:4 production from other groups of haptophytes than E. huxlei. This is also evident from the choice of showing and discussing both the UK 37 and UK'37 indexes. I think the authors do a good job of highlighting the issues and I understand the decision of using the UK37 given the similarity with present temperature range in the surface waters. However, I think the manuscript would benefit with adding a discussion of potentially advected alkenones deposited at the core site. I find it interesting that the UK'37 derived temperature, although far higher than SST in the wider region; overall display the same variability as the Mg/Ca bottom temperature reconstruction in the last 6,000 years. Would it be possible that the alkenones deposited at the core site contain a significant fraction of alkenones synthesized far away, in the Irminger Sea (where coccolith blooms are the most extensive for the entire northern North Atlantic Ocean) and are transported with the WGC? The alkenone concentration also resembles the UK'37 and Mg/Ca pattern of variability, which could add support to the reliability of the UK'37 as increased WGC inflow signal and/or increased coccolith blooming in the Irminger Sea? This would not alter the main conclusions of the manuscript, in terms of the paleoceanographic

conclusions arrived at. It would just open up the possibility that alkenones are not only dropped vertically down the water column, but are also transported around the wider ocean with the very dynamic current systems and thus may represent an integrated SST signal from a larger region.

Try not to refer to geographical less known names that are not shown on map (Trinity Bay, Placenta Bay etc. etc)

Inform how far away (km) from the core site the hydrograpic sections (apart from the one measured during the cruise) are located.

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