

## ***Interactive comment on “The Holocene thermal maximum in the Nordic Seas: the impact of Greenland Ice Sheet melt and other forcings in a coupled atmosphere-sea ice-ocean model” by M. Blaschek and H. Renssen***

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Reply to anonymous Referee #2, interactive discussion (C2747-C2755, 2012) on "The Holocene thermal maximum in the Nordic Seas: the impact of Greenland Ice Sheet melt and other forcings in a coupled atmosphere-sea ice-ocean model" by M. Blaschek and H. Renssen:

We thank the referee for the positive and constructive review, which helps to improve the manuscript and its comparison to other modelling studies. We think it is a very valid

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and constructive suggestion to include maps with more surface properties (SSS and MLD) to better understand our results and evaluate with proxy reconstructions or other modelling studies not necessarily included in this study. Our initial focus on just SSTs might have been an unnecessary step in simplifying our results. Referee #2 mentions that there are lots of studies investigating freshwater hosing experiments in numerous time periods and that recent results from Swingedouw et al. (2012) find a somehow different fingerprint of GIS melt water. They simulated the impact of 0.1 Sv of melt water from the GIS in the period of 1965 to 2004 with 5-6 AOGCMs (one OGCM) and they find a “surprising” warming in the Nordic Seas, which they attribute to an emergence of Atlantic subsurface waters that are not influenced by mixing of the subpolar gyre due to capping of the surface by freshwater. We think that this study does not disagree with our results because the seasonal difference in the early Holocene is increased compared to the present-day one. We investigate melt water impact on higher summer SSTs in a warmer climate (as we compare 9kOGx1 to 9kOG) and in a next step to a climate cooled by the impacts of the LIS (9kOGGIS to 9kOGMELTICE). Although the melt water induced in their simulations (0.1 Sv) and in our final simulation (9kOG-GIS, 0.103 Sv) are indeed very close and even without the LIS ice sheet (9kOGMELT, 0.09 Sv) the two studies show some common patterns in SST cooling as a response to freshwater, but regarding the difference in time period and summer versus annual temperatures the two studies are different from each other. We find their results interesting in context to the proposed increased subsurface Atlantic water advection seen in proxy reconstructions (Risebrobakken et al., 2011) that is not evident in our model for 9ka BP. Therefore it might be useful to include this into the discussion in section 3.1.2 together with the discussion of proxy-based reconstructions. We further agree that the manuscript will improve by a more comprehensive description of the mechanisms (3.1.3) and propose to expand this in combination with changes from the other Referees, as well as previously mentioned new figures. In this context it is also viable to include locations and mentioned values in the text to figures, for instance figure 5. We sincerely thank the reviewer for noticing the mix up in Figure 4 with the colours

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and not resigning on our explanations and interpretations, that might have been quite doubtful due to this confusion. Thanks again.

For the comments and citations please see the supplement.

Please also note the supplement to this comment:

<http://www.clim-past-discuss.net/8/C3411/2013/cpd-8-C3411-2013-supplement.pdf>

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Interactive comment on Clim. Past Discuss., 8, 5263, 2012.

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