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Climate of the Past Discussions

Interactive comment on "Holocene trends in the foraminifer record from the Norwegian Sea and the North Atlantic Ocean" *by* C. Andersson et al.

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Journal: Climate of the Past Title: Holocene trends in the foraminifer record from the Norwegian Sea and the North Atlantic Ocean Author(s): C. Andersson et al. 2009 MS No.: cp-2009-45 Special Issue: Holocene climate variability over Scandinavia

GENERAL COMMENTS

This article tackles the difficult task of explaining the differences observed between paleoceanographic records obtained from different proxies. It does an excellent job summarizing the literature about the depth habitat of a few key foraminifera species routinely used as SST proxies or used for isotopic analysis, namely Neogloboquadrina pachyderma (dex and sin) and Globigerina bulloides. The authors discuss various

factors or mechanisms that could explain different trends in the foraminifera records from various sites, including changes in ocean circulation, variations in habitat depth or calcification seasons. Overall, this article is an important contribution to the field of paleoceanography and I strongly urge the editors to accept it for publication. It is well written and the discussion is easy to follow.

SPECIFIC COMMENTS Page 2082 The authors talk about "Holocene thermal maximum" and "early to mid-Holocene optimum". They ought to clarify whether these are separate/distinct events or if the difference in terminology simply stems from temporal differences (length and/or timing of the events).

Page 2083, 3rd sentence “However, Northeast Canada experienced a thermal optimum between 11-9 ka, about 4kyr before the thermal maximum in northeastern Canada (Kaufmann et al. 2004). “ This sentence could not be more confusing: should it read that the thermal optimum between 11-9 ka occurring in NW Canada while it occurs later in NE Canada?

Page 2085 Do you have a reference for the Maximum Likelihood technique?

Page 2085 The pre-industrial is 1780 but the greenhouse gases are those of 1750... Please clarify

Personally, I am not comfortable with the use of ponctual events (such as the mid-Holocene optimum) to compare the climatic response of various regions. Many of these event exhibit a time-transgressive nature across large geographic areas. but I understand that this is a methodology routinely used, for the sake of simplicity.

Page 2085-2086 I assume the various records are compared visually, but to be rigorous, how statistically similar are they?

Page 2091 Is the SST record of G. bulloides representative of the surface or of the surface mixed layer? If its habitat is the upper 60 m of the water column, then, how thick is the surface mixed layer?

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Pages 2093 The authors propose shifts in NAO mode to explain spatial differences in SST records across the North Atlantic. They do not explore the impact of the melting that was still occurring in the early Holocene, especially in North America. What is the impact of important volumes of freshwater to the North Atlantic Ocean? Could this affect the location of surface currents and that of the oceanic gyes?

Page 2094 The authors propose changes in surface currents (and position of the sub-polar front) and changes in the relative contribution of the sub-polar gyre and sub-tropical gyre, as an explanation for increasing salinity. My question here overlaps my comment for page 2093: what roles did the continuing melting play in the position of surface currents in the early Holocene? How did surface currents reacts when metling ended?

Finally, would the author consider changing the title of their article? The present title does not do justice to this very valuable attempt to explain differences between paleoceanographic records from surface and sub-surface dwelling organisms. I am looking forward to their next article on that same topic, using records with higher temporal resolution. I suggest the next article includes an expended section on the role of usrface curents and the position of oceanic gyres on the surface and sub-surface temperatures.

TECHNICAL CORRECTIONS Page 2084 Lines 13-14: “Multiple sea surface temperature proxies have been developed and published for core MD95-2011. “ is redundant if we consider the sentence on lines 21-22: “Multiple proxies for ocean-surface reconstructions have been developed for core MD95-2011. “ I propose to delete the sentence on lines 13-14.

Page 2085 First paragraph, lines 13-14.: “.....to easily draw cross-references to the already published data from the Norwegian Sea and the North Atlantic as discussed in this paper. “ Page 2085: “In this study” come back four times on the same page.....authors should remove some of these.....

Page 2087 line 1: “....compared to at present” should probably be “....compared to the

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present". Page 2087 First paragraph: I would like to know what figures the authors are referring to instead of only using the references: For example, the radiolarian SST reconstruction of Dolven et al. 2002 is figure 2E. etc. This would guide the reader.

Page 2088 line 13 calcification.....occurs

p. 2092 line 5: should probably delete the word "it".

p. 2094, line 20: should add the word in ".....could explain Holocene changes in sub-thermocline salinity....."

p. 2095, line 25 sentence would read better if "we turn to" was deleted.

Interactive comment on Clim. Past Discuss., 5, 2081, 2009.