Biogeosciences Discuss.,
https://doi.org/10.5194/bg-2019-79-RC3, 2019

Biogeosciences Discussions

Interactive comment on "Variable habitat depth of the planktonic foraminifera *Neogloboquadrina pachyderma* in the northern high latitudes explained by sea-ice and chlorophyll concentration" *by* Mattia Greco et al.

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Received and published: 29 March 2019

Greco and co-authors compiled new and published vertical abundance data from multi-net tows to evaluate – using statistical approaches – the habitat depth of polar foraminifera N. pachyderma and its relationship to environmental parameters. The study provides new and important insights into a species widely used in paleoceanographic reconstructions, but still with limited information on its living conditions. The authors compare their evidence also to the outcome of the PLAFOM2.0 model (with limited success). With the environmental changes currently occurring in the subpolar

North Atlantic and Arctic Ocean this study is for sure timely and relevant for any future studies. The manuscript is well written, the data well presented and deserves to be published in Biogeosciences after minor revision.

The following are more general comments that might help improve the manuscript, but are not essential for accepting the manuscript:

1) There exists a very nice study (PhD thesis) [in German] on "The planktonic foraminifera Neogloboquadrina pachyderma (Ehrenberg) in the Weddell Sea, Antarctica" by Doris Berberich published as Berichte zur Polarforschung 195, in 1996. Although this is a different genotype than in the northern hemisphere, it seems that some aspects of the Greco et al. and Berberich observations are similar. So I urge the authors to have a look at this work. I do not know, if the authors could verify with their data is the deeper depth habitat in their data is also related to more adult/ terminal stage specimens and thus potentially to the reproduction cycle. Berberich is also discussing influence of phytoplankton abundance (i.e., food supply) on the foraminifera abundance and sees similar changes in depth as discussed on p. 9 lines 17 to 30. She is referring to Arikawa (1983) when discussing the relationship between N. pachyderma abundance and the deep chlorophyll a maximum. So the Arikawa study is another one the current authors should look into as support for their observation that the depth habitat of their genotype of N. pachyderma appears to be below the chlorophyll maximum. Arikawa, R. (1983), Distribution and taxonomy of Globigerina pachyderma (Ehrenberg) off the Sanriku Coast, Northeast Honshu, Japan. Tohoku Euniv. Sci. Repts., Ser. 2 (Geol.), 53, p. 103-157

2) p. 4 line 29: did the authors inquire at the AWI oceanography group if the CTD data collected during the ARK campaigns might have been stored there? Since I participated in ARK-X/2, I verified the cruise report and it clearly says on page 95 that at most stations with plankton sampling hydrographic information was obtained with a CTD probe.

More detailed comments to the manuscript itself:

1) throughout the manuscript you are referring to the North Atlantic, even though your samples are actually limited to the subpolar and polar regions of the North Atlantic. If you do not want to use the term Nordic Seas (for the area between Iceland, Greenland, Norway and Svalbard), you could use "northern North Atlantic" to better describe the geographical range of your samples.

2) p. 3 line 26: why is food source/supply not mentioned here -although one could argue that this could be a consequence of the change in the environmental conditions?

3) Material: please provide a table with the stations, date/ year of collection, data source for published data. From your figures one can deduce the season etc., but not how the samples are distributed over the years. Please also provide the name of the station excluded from the Jensen (1998) data set.

4) p. 4 line 18: please provide the depth until which pigment concentrations were measured. Were the profiles also done down to 300 m?

5) p. 5 line 11: small English correction; it should say "related to"

6) p. 7 line 15: it would be good if you could provide the reader with the information how and in which geographical resolution sea ice and chlorophyll are presented in the earth system model, from which PLAFOM2.0 derives its environmental conditions. I wonder if the poor relationship between observations and model might be a resolution problem or sea ice itself not being presented in the model.

7) p. 9 line 14: if the authors would like to include a study more concentrated on isotopic evidence from the Arctic Ocean they could add the following reference: could also look into Hillaire-Marcel, C., 2011. Foraminifera isotopic records... with special attention to high northern latitudes and the impact of sea-ice distillation processes. IOP Conference Series: Earth and Environmental Science 14, doi:10.1088/1755-1315/14/1/012009

8) p. 9 line 30: although the authors write on p 10 line 18 that the species is likely not grazing on fresh phytoplankton, I wonder if type of food source might not be a driver with a preference for "fresh food" during period with a shallower DH and more refracted organic matter during periods when the species prefers the depths below the chlorophyll maximum.

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