

## ***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.***

### **Anonymous Referee #1**

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Greco et al. present an interesting study on the variability of depth habitat of the planktonic foraminifera *N. pachyderma*, the most important species in the Arctic. Due to the ubiquity of *N. pachyderma* both in paleo-records and in present-day Arctic and the significance of its depth habitat for paleoreconstructions, the authors address a relevant scientific question within the scope of BG. The presented results can be used in paleoreconstructions as long as there are proxy on chlorophyll and sea-ice concentration available. The authors compile new and existing data from the Arctic and the North Atlantic Ocean and the substantial conclusions that they come up with are

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also novel. The scientific methods and assumptions are valid and clearly outlined and the results are sufficient to support the interpretations and conclusions. The authors compare the observational data with a numerical model though this comparison only shows that the model does not perform very well. The methods are described sufficiently precisely. However, as I am not an expert on statistics, I cannot evaluate this aspect of the manuscript. The authors give proper credit to related work and clearly indicate their own contributions. The title clearly reflects the contents of the paper and the abstract provides a concise and complete summary. The MS is well-structured and written and the language is fluent and precise. Therefore I find the MS suitable for publication in Biogeosciences after minor revisions according to general, specific and technical comments listed below. I am looking forward for the authors' response and further discussion.

#### General comments

The authors use the term 'habitat depth' along with 'depth habitat (DH)' which is a bit confusing. Are these two different terms? If so, what is the difference between them? Wouldn't it be better to stick to only one of these terms? I don't see a significant difference between them.

A table listing all the published profiles used in the study and/or a more detailed location map would be useful, at least as an appendix or supplementary material. Now it is completely unclear what published data are you using.

A weak, though unavoidable, point of the study is that it compiles data with different sampling depth intervals which might bias the calculated DHs. The authors should stress and discuss this issue a bit more.

#### Specific comments

2.3 (page 2, line 3) and 2.20: I know that 'climate change' is a catchy phrase but *N. pachyderma* is a marine species and so it doesn't directly react to climate changes

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but rather to changes in marine environment (which, of course, are usually related to climate changes). Please be more precise in your wording!

2.22: Please change 'Arctic and its marginal seas' to either 'Arctic Ocean and its marginal seas' or just 'Arctic' (or 'Arctic seas').

4.3: similar as above

4.30-32: It is not clear whether the satellite data were used only for data generated by the authors or also for the data from the literature. Please explain.

7.8: In the text the adjusted  $r^2 = 0.32$ , while in Table 3 it's  $0.336 \approx 0.34$ . Please correct or explain the difference.

8.27: It might not be clear to a reader whether 'lowering the DCM' means lowering the value of the DCM, i.e. moving it up the water column (shallowing) or lowering it 'geometrically', i.e. moving it down the water column (deepening, which I guess is the case). Please clarify.

9.26: 'at the depth of DH' please rephrase.

24: The small diagrams in Fig. 4b (normalized density profiles?) need more explanation.

Technical comments

2.32: I'm not sure about the rules concerning citing of papers with three authors in Biogeosciences but shouldn't it be just 'Ding et al., 2014'?

5.9: Table 2 is referenced in the text before Table 1. Again I am not sure about the rules in BG, but I guess you should change the numeration.

5.14: I suppose 'Fig. 2d' was meant.

5.33 & 6.1-2: You already introduce the DVM abbreviation so use it!

6.14: Use 'DH' instead of 'depth habitat'

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9.2: 'sea-surface' instead of 'seas-surface'

10.27: An unnecessary 'the' after 'mismatch'.

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