

Response to Editor

Thank you for your last revision of your manuscript "120 years of sea-ice conditions on the Northeast Greenland continental shelf: a biomarker and observational record comparison", submitted to EGUSphere/The Cryosphere, the improvements you and your co-authors made, and for additional information about your changes.

Thank you for the final comments on our manuscript, we have addressed all the changes in red below.

I kindly ask you to revise your manuscript according to the new comments made by reviewer 1 (see reviewer 1 report from 22 April 2024); in addition I have the three following comments:

- (1) You write in the title and text in the beginning of the manuscript "120 years" and "recent changes (120 years)". In Fig. 8 the time axis/data ranges from 1880 to about 2015-17 (depending which subdiagram one looks at). I suggest (unless I have overseen it somewhere) to consider writing early in the manuscript from when to when your study applies (the term "recent" alone would make the statement somehow connected to a publication date), and adjust the total time amount, if it should be more than 120 years (like 130 or 135 years).

Thank you for pointing this out, we have now changed this to 130 years to reflect the 1880-2017 study period throughout the manuscript and in the title as suggested. As suggested, we have clarified the time period when we use the term 'recent' in the abstract and in more detail in the introduction (Lines 71-72). The reason for originally using 120 years is that that is our lowest reliable age, but of course, this is clear from the age model in the manuscript and 130 years is more correct.

I see that reviewer 2 had commented in the previous round (last comment before technical comments) the sea ice situation in 2021, and I saw no response to you on that point; possibly because this is after the time frame you discuss in your manuscript? I would appreciate if you could explain that.

Thank you for this comment, as you mention we do not discuss the sea ice changes after 2017 as it is outside of the study period constrained by the biomarker data due to the date of core collection. However, we agree that this is important to clarify so have added this to the methodology (Lines 218-220).

- (2) In the conclusions in line 473 you write "until 1900" for what I understand means back in time. Two lines further, you use for another core the wording "prior to 1954". I find "prior to" clearer and easier to follow/understand, and I suggest to use another wording than "until" in line 473.

We agree that this is unclear, and the statement refers to data later than 1900 in cores 109R and 134R as this is where we have the first age marker. As there is no 1900 marker in 90R we use 'prior to'. We have updated the text to:

“For cores 109R and 134R, the age model is reliable for the time period after 1900, where the earliest age marker is found (210Pb reaches base level).”

Now lines 461-462.

- (3) Recently, Wekerle et al. (2024; <https://doi.org/10.1038/s41467-024-45650-z>) published about Atlantic water warming of the ice tongue of the 79N glacier to the west of the area you are discussing. I suggest to consider taking this publication into account when discussing Atlantification/reasons for the regional sea ice changes (lines 460, 491 in version 3 of your manuscript), and where you introduce the 79N glacier and NEGIS (lines 90-99).

Thank you for highlighting this new paper, we agree that it should be added to our paper. This has been included in the regional setting outline (Lines 98-99) and in the discussion (Line 452) as suggested.

Response to Reviewer 1

Thank you again for considering my comments and suggestions. Below some final comments before the manuscript may be acceptable for publication

We thank the reviewer for taking the time to review our manuscript again and have responded to the specific comments below.

1. In your revised manuscript you state that “you use organic bulk parameter data only to normalize the sea-ice biomarker data in this study”. I think you should consequently do so. Remove Figure 3 and adjust chapter 4.2.

We agree that removing this would make the purpose of this data in the manuscript clearer, so have done so accordingly. However, we believe that this dataset is still useful to provide in the supplementary material so have moved the figure to this part.

Also remove lines 356-359 as you use XRF data only for “precise core correlation”.

This has been done.

2. Check sentence in line 352 starting with “However, the reversal...” I think the sentence is incomplete.

Thank you for noticing this mistake, we have now updated the text.

3. Line 298: Should it be “The ratio of Bra/24-Me is high in the lower part of core 134R....?”

Yes, this was a mistake and we have updated with the reviewer’s correction.

4. Line 308: “Degradation products gradually increase from 8 cm in...”

We have corrected this in the manuscript.