

Editor comments on Detlef et al. resubmission

I would like to thank the authors for submitting a thorough response to the reviewers' comments and a revised version of their manuscript, and the reviewers for confirming that their comments have been appropriately addressed.

Two of the reviewers raise minor technical issues that should be addressed prior to publication. In addition, I list a number of suggestions below that are intended to improve the clarity of the text. In general, the article is very well written, and I leave it to the authors to decide whether to adopt my very minor suggestions.

This is an important and comprehensive multi-proxy study into Holocene sea ice conditions in Petermann Fjord and the wider implications of Nares Strait ice arch formation. I am delighted to recommend this article for publication once the minor technical issues documented below and in the reviewer reports have been addressed.

Thank you for choosing to publish your research in The Cryosphere.

Pippa Whitehouse (Editor)

Minor editorial suggestions (line numbers refer to non-track-changed version of the article)

Line 16: suggest "...a transect of cores, *extending* from Nares Strait to *underneath* the 48 km ice tongue of Petermann Glacier, ..."

Line 46: the statement about the 'emerging prominence of the northern arch' seems to be at odds with the previous sentence that documents a recent reduction in the number of days that Nares Strait is blocked each year. Please review the logic of these two sentences.

Line 52-53: the two halves of this sentence – before and after "in response to" – do not fit together very well. Please summarise the key points more clearly (they are covered very clearly in section 2)

Line 65: suggest "...a 4-year period with no/little landfast ice in Nares Strait, *and which was associated with the* earlier break-up of landfast in Petermann Fjord"

Line 97: "PGs" needs an apostrophe (PG's), but instead, I suggest "PGs" -> "the PG" (also line 62)

Lines 149-150: comparing with the second half of this sentence (lines 151-152), I suggest rephrasing the first part of the sentence to make it clearer that when there is mobile sea ice in Nares Strait, in spring/early summer, the ice edge is located within/at the mouth of Petermann Fjord

Line 314: suggest "...are presented *in terms of their depth within the core, to account for the fact that sediment ages are unconstrained in the bottom ca. 1.5 m of the core.*"

Line 316: suggest "..., *which are* characteristic of..."

Line 329: results are generally reported working up the core, e.g. "between 154 cm and 70 cm" (line 331), i.e. forwards in time. However, some depths are reported from shallow to deep, e.g. "between 154 cm and 199 cm" (line 329). Please check for consistency throughout all the results sections.

Lines 394 and 395: should references to unit 1C actually be to unit 1A?

Line 519: suggest "..., *which is* characterized by..."

Line 551: suggest “..., *which were* associated with...”

Figure 6: please explain the blue/green +/- symbols and clarify the meaning of the labels ‘IP₂₅’ and ‘Phyto. Marker’ in the caption, e.g. when you mention “sea ice biomarker and primary productivity indicators”. Apologies if I have missed this information elsewhere in the manuscript.

Line 587: suggest “...associated with variable HBI III fluxes *at Kane2b*, ...”

Line 688: suggest “...this *coincides* with some driftwood landings...”

Line 694-695: I found this sentence a little confusing, would it be correct to say, “Georgiadis et al. (2020) interpret *low* HBI III as indicating ice loaded fresh surface waters *due* to mobile sea ice...”

Line 725: suggest “...*leads to* a regime...”

Line 744-746: consider re-ordering the ideas in this sentence, “Sea ice has the ability to influence the oceanic heat transport to Petermann Fjord by regulating the wind stress at the atmosphere/ocean interface in Nares Strait, which in turn modifies the circulation-driven inflow of AAW (reference).”

Line 758: (also mentioned by reviewer 1) I suggest “... is unlikely to have resulted in a prolonged...”

Line 767: including -> included ?

Line 775: “In light of the recent development” – please clarify what this refers to

Lines 791-792: “seasonal coastal melt” – not previously mentioned, please provide a reference or other supporting evidence