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Climate of the Past
Discussions

Interactive comment on "Deglacial to postglacial history of Nares Strait, Northwest Greenland: a marine perspective" *by* Eleanor Georgiadis et al.

Eleanor Georgiadis et al.

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Dear referee 1,

Thank you again for your review of our work. Please find attached our point-by-point response to you comments relevant to our initial manuscript, and the revised version of this manuscript following you comments and those of referee 2.

Yours sincerely,

On behalf of all co-authors, Eleanor Georgiadis

Please also note the supplement to this comment:
https://www.clim-past-discuss.net/cp-2018-78/cp-2018-78-AC3-supplement.pdf

Interactive comment on Clim. Past Discuss., https://doi.org/10.5194/cp-2018-78, 2018.

We would like to thank referee 1 again for allowing us the opportunity to submit a revised version of our work, which we believe has been greatly improved by the detailed review provided by referee 1.
We previously issued a short reply to the referee addressing the main comments that were made in the review. We have taken into account referee 1's suggestions in our revised version which we have submitted, and we would also like to provide a point-by-point response to the original revision in which our responses are in blue font.

Review by anonymous referee 1 and our responses

Thank you for the opportunity to review Georgiadis and colleagues paper. They present new data, including grain-size, CT, XRF, and radiocarbon, from sediment core AMD14-Kane2b from Kane Basin and discuss implications for the deglaciation of Nares Strait. They infer a major deglacial event, the opening of Nares Strait, from an IRD event and XRF geochemistry. It is a good dataset and is suitable for publication in Climates of the Past. However, there are a few important issues in the discussion and data treatment that should be addressed before this manuscript is accepted for publication. First, I like to praise how the paper focuses on a detailed description of the core stratigraphy on depth. The inclusion of Table 2 in addition to Figure 5 make it very easy for me, the reader, to understand the stratigraphy of the core and the author's interpretation of that stratigraphy. In my view, the most important take away from this paper is the clear description of the stratigraphy and I applaud the authors for that. My biggest issue with the paper is how the authors make statements regarding the meaning of the data and then fit their interpretations to that model. This is particularly true for the XRF data. With the detailed grain-size data set the authors have generated, it would be much more informative to learn about the relationship between sediment geochemistry and grain-size based on Kane Basin data instead of importing conceptual models from vastly different depositional environments. This would make the results of this study much more convincing and help other researchers working in the region. At a minimum, the authors need to be clearer about what is their interpretation and what is supported by data in the results section. I recommend adding a figure showing the relationships between XRF element counts and particle size in the various lithologic units, as this relationship (or lack of relationship) is central to many of the interpretations made by the authors. I would also like to see the authors expand their discussion to include how their data compare to another marine perspective on the Holocene deglaciation of Nares Strait by Jennings et al. (2011). Although the paper is referenced in the introduction and the discussion, the authors do not address why their age for the opening of Nares Strait is younger. I believe the two observations can be reconciled, but it is worth a discussion by the authors as Jennings et al. present faunal and stable isotope data that clearly show the change in oceanographic conditions with the opening of the strait and have a high quality age constraint above the transition at 8,328-8,528 cal yrs BP (ΔR = 335±85) based on Neogloboquadrina pachyderma sinistral. I consider these to be more reliable evidence than semi-quantitative bulk-sediment geochemistry and an IRD event layer.
We would like to thank you for your encouraging review and overall appreciation of the sedimentological study in our paper. We have tried to address your comments concerning the geochemical study and have also added a comparison of our data with Jennings et al. (2011) and Reusche et al. (2018) in the discussion section of our revised version.

Fig. 1. Reply to referee1

Deglacial to postglacial history of Nares Strait, Northwest Greenland: a marine perspective from Kane Basin

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Abstract. A radiocarbon dated marine sediment core retrieved in Kane Basin, central Nares Strait, was analysed to constrain the timing of the postglacial opening of this Arctic gateway and its Holocene evolution. This study is based on a set of sedimentological and geochemical proxies of changing sedimentary processes and sources that ~~translate into ice sheet configuration in the strait~~ provide new insight into the evolution of ice sheet configuration in Nares Strait. Proglacial marine sedimentation at the core site initiated *ca*. 9.0 cal. ka BP following the retreat of grounded ice. Varying contributions of sand and clasts suggest ~~U~~unstable sea ~~surface~~ ice conditions and glacial activity which subsisted until *ca*. 7.5 cal. ka BP under the combined influence of warm atmospheric temperatures and proglacial cooling induced by the nearby Innuitian (IIS) and Greenland (GIS) ice sheets. An IRD-rich interval is interpreted as ~~T~~the collapse of the ice saddle in Kennedy Channel *ca*. ~~at~~ 8.3 cal. ka BP that marks the complete opening of Nares Strait and the initial connection between the Lincoln Sea and northernmost Baffin Bay. Delivery of sediment by icebergs was strengthened between *ca* 8.3 and *ca*. 7.5 cal. ka BP following the collapse of the buttress of glacial ice in Kennedy Channel that triggered the acceleration of GIS and IIS fluxes toward Nares Strait. The destabilisation in glacial ice eventually led to the rapid retreat of the GIS in eastern Kane Basin at about 8.1 cal. ka BP as evidenced by a noticeable change in sediment ~~source~~ georchemestry in our core. The gradual decrease of carbonate inputs to Kane Basin between ~8.1 and ~4.1 cal. ka BP reflects the late deglaciation of Washington Land. The shoaling of Kane Basin can be observed in our record by the increased winnowing of lighter particles as the glacio-isostatic rebound brought the seabed closer to subsurface currents. ~~Our dataset suggests t~~Reduced iceberg delivery from 7.5 to 1.9 cal ka BP inferred by our dataset ~~in relation to the Neoglacial cooling that likely enhanced sea ice occurrence, thus suppressing~~

Fig. 2. Revised manuscript