

Interactive comment on “Glacial sedimentation, fluxes and erosion rates associated with ice retreat in Petermann Fjord and Nares Strait, NW Greenland” by Kelly A. Hogan et al.

Anonymous Referee #1

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This is a well written and illustrated paper that presents new data on glacial sediment fluxes and erosion rates associated with the retreat of Petermann Glacier in NW Greenland. The paper is very appropriate to The Cryosphere. However, there are a few issues that need to be addressed:

1. You state that this is the first comprehensive investigation of the glacial-sedimentary infill of a major fjord system in Greenland (last para of Introduction and first line of Conclusions). I think you could do with justifying this claim a bit more robustly. For example the lead author has herself published on a similar topic from Disko Bugt/Jakobshavn Isbrae (e.g., Hogan et al., 2012 Marine Geology) and there has been previous work

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carried out on seismic stratigraphy in East Greenland fjords (Scoresby Sund – e.g., Uenzelmann-Neben, et al. 1991: Quaternary sediments in Scoresby Sund. East Greenland: their distribution from reflection seismic data. In Moller et al. (eds.): The Last Interglacial-Glacial Cycle: Jameson Land and Scoresby Sund, East Greenland). It may be that the present study significantly supersedes this earlier work but more justification/comment on this is required.

2. Line 132. Explain why a delta-R of 268+/- 82 was chosen.

3. I suggest you change Sub-heading 4.2 'Petermann Fjord' to something a bit more informative, particularly as sub-heading 4.1 is 'Seismo-acoustic facies and depositional environments in Petermann Fjord and Nares Strait'.

4. Lines 230-233 and Line 316. You state that subglacial tills are deposited as sediment gravity flows. But gravity flows are NOT subglacial tills. For a recent treatment see D.J.A. Evans 2018 – 'Till'. Please change.

5. Lines 369-371. You suggest that pre-LGM sediments most likely do not occur citing as support the presence of glacially-sculpted bedrock surfaces and referring to Jakobsson et al. (2018). I think this is pretty thin evidence. For example, pre-LGM sediments could be preserved locally within bedrock depressions and/or be too thin to be resolved by your seismic system(s). At the very least I would suggest the inclusion of a caveat acknowledging this would be appropriate here.

6. Lines 372-373. You state that glaciomarine sedimentation seaward of the grounding line has two components the first of which is that of coarse or mixed material delivered to the grounding zone as subglacial deposits. But how is this material actually deposited? It is glaciomarine sediment deposited seaward of the grounding line, so although it might be delivered to the grounding line subglacially it is not deposited seaward of the grounding line as a subglacial till.

7. Line 430. You mention previous work which suggests that most of the sediment

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delivered by tidewater glaciers remains in the fjord system and you go on to state that “this assumption is particularly reasonable for Petermann”. But is Petermann really a tidewater glacier? Surely it is more of a hybrid between an ice shelf and a tidewater glacier given its floating tongue?

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