

Interactive comment on “Cryostratigraphy, sedimentology and the late Quaternary evolution of the Zackenberg Delta, Northeast Greenland” by Graham L. Gilbert et al.

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Received and published: 14 March 2017

The manuscript provided by Gilbert et al. seeks to reconstruct environmental conditions that determine sediment facies development and permafrost characteristics in a proglacial and periglacial environment of the high Arctic along the northeast Greenland coast. This study is especially interesting because it provides baseline geoscientific data on postglacial landscape development of an area that is a long-term monitoring station in the Arctic. Any kind of study relating to e.g. landscape formation, soil sciences, carbon turnover, microbiology, vegetation succession, sea-level change, or coastal geomorphology will need such information on the timing of glacial meltdown, sedimentation milieu and permafrost development.

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The authors present very thorough data and observations on sediment fabrics, grain-size composition and cryofacies in two sediments cores. Such small-scale observation is aided by similar data from natural exposures in the area. Fourteen OSL from the two cores ages serve as age control. Figures and tables are of excellent quality and help the general understanding of the manuscript. Overall the quality of the manuscript is very good, the language is clear and almost free of mistakes.

I suggest the manuscript to be accepted after minor revisions.

General comments:

1. The abstract is rather short and could benefit from more results and interpretation so that the main message of the manuscript comes across right with the abstract.
2. OSL Dating Please provide more detail on the OSL dating in the methods, especially how you have dealt with potential errors such as fading or incomplete bleaching. You should also provide reasoning (not only in the figure caption) why both OSL on quartz and IRSL on feldspar were measured but only OSL ages are discussed. One major novel statement of the manuscript is the presumably earlier recession of the ice from the study area based on OSL ages in comparison to earlier studies based on ¹⁴C radiocarbon ages. OSL ages usually come with higher uncertainties and standard errors than ¹⁴C-ages in this age range. However, the errors are not discussed here although they could easily move your OSL ages in the same age range as obtained by Bennike. Bennike's ages are right at the termination or after the termination of the Younger Dryas. In contrast, your ages are right within the Younger Dryas which is not prominent for widespread deglaciation but for the opposite. Please re-consider your arguments.
3. The authors use cryofacies terms that do not exist as such. (1) pore cryofacies, (2) layer cryofacies both are not cryofacies terms as it can be found or related to the

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literature. Pore ice is a certain ground ice type. Better use the term "structureless" as introduced in Murton and French 1994 and also used in French and Shur 2010. Then replace the new term throughout the manuscript. The same applies to "layer cryofacies" that should be replaced throughout by "layered". Be careful to also change this in the figure captions.

Specific comments:

For specific comments see the annotated and attached pdf-file.

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Please also note the supplement to this comment:

<http://www.the-cryosphere-discuss.net/tc-2016-299/tc-2016-299-RC3-supplement.pdf>

Interactive comment on The Cryosphere Discuss., doi:10.5194/tc-2016-299, 2017.