



EGUsphere, referee comment RC1
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Comment on egusphere-2022-805

Suzanne Bevan (Referee)

Referee comment on "The control of short-term ice mélange weakening episodes on calving activity at major Greenland outlet glaciers" by Adrien Wehrlé et al., EGU Sphere, <https://doi.org/10.5194/egusphere-2022-805-RC1>, 2022

This paper reports on investigations into the short-term control of ice mélange on calving of 3 Greenland tidewater glaciers, Kangerdlugssuaq, Helheim and Jakobshavn Isbrae. Although the seasonal impact of ice mélange on calving has been observed and reported on, the analysis of individual episodes of mélange weakening and associated calving behaviour during multiple summer periods is new. The authors use a combination of radar and optical satellite data to detect and track the up-fjord propagation of ice mélange weakening (IMW) fronts. The authors then demonstrate that a significant proportion of these events are closely followed by a calving event, and also that most calving events are preceded by an IMW front reaching the glacier terminus.

A simple one-dimensional random walk model was able to capture similar IMW events to those observed. The model also demonstrated that only a limited range of model parameters resulted in a stable but oscillating calving front. A delicate balance between iceberg size and the downstream transport of icebergs is required.

The significance of the work is mostly applicable to fast flowing glaciers in narrow fjords where mélange is able to consolidate. Under atmospheric or oceanic warming, the balancing act between processes permitting ice jamming and dispersion is likely to be disrupted, or extended into year-round phenomenon, such as happened at KG in 2018/2019.

This is a really interesting paper, making good use of the ever-improving satellite observational capacity. An excellent discussion explains and puts the results into context.

Suggestions for minor improvements include:

Line 22, delete 'with'.

Line 27, replace 'combination between' with 'combination with'.

Line 35, 'remains'

Line 58, replace 'brought' with 'provided'.

Line 61, replace 'The latter' with 'These studies'.

Line 74, there is a random 'x' before '(Luckman'.

Line 92, replace 'Center' with 'central'.

Line 109, replace 'Associated to' with 'Associated with'.

Line 121, replace 'quantified' with 'assigned'.

Line 152, where does the time scale needed for acceleration of a large iceberg derive from? I see later from Appendix A but there doesn't seem to be any Appendix available.

Line 158, 'implemented'

Line 167, 'turn over' would be better.

Table 1. The min and max values for Dx_{max} differ from those in the text (line 153).

Figs. 2-4. Add full dates to the panels, especially in fig. 4 where there are two events in 2018.

Line 266, replace 'episodes than during' with 'episodes as during'.

Supplementary videos S5-S7 need a little text to explain them. Does the red bar mark the IMW front? If so, why is it so far up-fjord from the more broken mélange?

Fig. 6. Are the extrema in the pdfs determined by the actual observations or are they probability intervals?

Fig. 9. Change the axis titles to agree with the caption.

Line 356, this sentence needs rewriting somehow, it is not clear at the moment what is intended.

Line 361, I think it could be helpful here to expand on 'slow'. Robel (2017) talks about a few days, which fits in nicely with the minimum time observed between successive IMW propagation events.

Line 433, 'faster than' what?