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The Cryosphere Discussions

Interactive comment on "Initiation of a major calving event on Bowdoin Glacier captured by UAV photogrammetry" *by* Guillaume Jouvet et al.

Anonymous Referee #2

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Summary In this paper the authors combine remote sensing with satellite data and aerial photogrammetry as well as modelling using ELMER/ICE to analyse a calving event on the Bowdoin Glacier in north eastern Greenland. Their observations from before and after the event allow them to make inferences about both the way the crack propagated and the likely future retreat of the glacier. Furthermore, the authors consider this a useful case study for similar glaciological investigations in the future. Comments This is a very nice example of a study that uses many different techniques, some of them fairly novel, such as the use of the UAV to derive very detailed strain rates, in order to clarify an important glaciological process. In this case, the process of crack initiation and calving are studied on a glacier that is representative of many Greenlandic outlet glaciers. The authors have clearly thought hard about how to introduce and structure this paper such that the disparate techniques are well explained and build a

consistent picture of the whole. The paper is very well written and easy to follow, there are a few typos + English language errors which I list below. I have no hesitation in recommending this paper for publication however there are a few minor corrections I would suggest. Improvements: 1. The retreat of the Bowdoin Glacier is undoubtedly interesting, particularly given different timings of retreat from local and regional glaciers so I think it would be helpful to point out that while the general retreat around Greenland is triggered by warming temperatures, local conditions determine the timing and pace of retreat. There is now quite a lot of evidence from temperature data in Greenland and fairly long records are available for Thule/Pituffik but I think reference to one of the many studies that have been done Kjeldsen et al for example would be fine. 2. On a similar point, you mention in the discussion that the crack propagated down after the 16th July – possibly in response to a change in water level. Have you looked to see if this is from meltwater? July is the middle of the ablation season and there should be a lot of meltwater going in. It would be neat to see if the calving activity matches up well with the melt activity 3. On page 12, line 26 you state Nye 1957 had an analytical solution for water in crevasses. I'm pretty sure Nye's 1957 paper did not include water in the crevasses in the analytical solution but I could be wrong and can't find my copy of it right now so do check this. It is something we developed in the Benn et al 2007 paper to an extent and I also did quite a lot of modelling in my thesis of this but it's not been published and as you say here the stress concentration at the crack tip effect is a problem. However Hans Weertman's work (1974,1977 and chapter 10 in his book) are relevant here and might prove interesting to further study. I do not necessarily think you should go into this here though but do check the reference! Typos: p.2 line 28 "terms" p.3. line 10 "upstream of its" p.7 line 18 "flotation" not floatatio p.8 line 6 "to mimic a bump presumed responsible.." line20 "north-west tens of days later" p.12 line 10 "issue, and confirms that the fracture extends to the front" p.12 line 26: "we cannot corroborate" line 27 "since Nye's formula" line 29 "upstream of the junction" p.13 line 16 "extends" p.14 line 6 "the plume suggests that there is" or "the plume shows that there is" line 11 doesn't make sense - while digging locally the foot of the calving front

locally ?

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