

## ***Interactive comment on “Grounding line migration through the calving season of Jakobshavn Isbræ, Greenland, observed with terrestrial radar interferometry” by Surui Xie et al.***

### **Anonymous Referee #2**

Received and published: 15 February 2018

This study analyzed terrestrial radar interferometry data collected at Jakobshavn Isbrae during field campaigns in 2012, 2015, and 2016. Through tidal analysis of line-of-sight velocities, the authors conclude that the terminus is floating in early summer and becomes increasingly grounded as the terminus retreats throughout the summer. These observations build on previous work from Jakobshavn Isbrae and elsewhere, which together provide a consistent picture of terminus morphology. These observations provide important insights into the processes influencing iceberg calving rates.

The observations in the paper are good, but the paper could use some editing to improve clarity and focus. For example, although interesting, the discussion of ice

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melange is not really relevant to the paper as written. I suggest either removing the discussion of ice melange or better integrating it into the text. The paper is about grounding line migration, but then there are some sentences and paragraphs about ice melange that are sprinkled throughout the manuscript but that don't really fit with the rest of the paper.

The paper also isn't particularly long, which makes me wonder why additional text is needed in supplementary material. Couldn't it be incorporated into the manuscript? The portion about the feature tracking seems to be important, but is only briefly mentioned in the main text.

Some of the figures could also use work: 1. The green lines in Figure 2 are almost undetectable, and the red and green lines will be difficult for some readers.

2. Figure 6 is also really difficult to read, and it may be misleading in that the tidal response appears to grow in both the upglacier and downglacier directions, but is minimal somewhere in between. I understand that this is at least partially due to flow direction not corresponding with line of sight, but that needs to be made more clear. You could indicate that the smallest response occurs where the flow is perpendicular to line of sight.

3. Figure 9: It would be nice to see the location of the radar on these maps. Its pretty obvious where its located in the MLI images in previous figures, but not in the DEMs.

4. Figure 12: I'm not sure what purpose this figure really serves.

5. Figure 13: Its really difficult to see the arrows in panel a. And why are feature tracking velocities projected onto line of sight? That seems backward and misleading to me, as it gives the impression that velocity variations are toward/away from the radar. I think it would be better to project the LOS velocities into map view, and then talk about what causes the variations in "true" velocity.

Some specific comments: Page 1, Line 5: I would not say that ice is locally thin if the

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freeboard is less than 125 m!

Page 1, Line 22: “down dipping upstream bed” is confusing. Do you mean retrograde bed?

Page 2, Line 2: “ice speed accelerates” – speed doesn’t accelerate, but ice does

Page 2, Line 15: “grounding line position” is not really a “basal condition”

Page 2, Line 30: “through a calving season”? This makes it sound like you were operating the TRI all summer long, which is misleading.

Page 5, Line 19: “The amplitude” of? I’m not quite sure what this refers to.

Pages 5-6 (and supplement): The step-change in ice melange thickness is interesting and suggests that the ice melange has a “terminus”. However the discussion is highly speculative and doesn’t really fit in this subsection, which is about tidal analysis. Also, I don’t buy the idea that the change occurs because of some bedrock topographic feature. I wonder if instead you are seeing the remnants of the winter melange that hasn’t yet lost cohesiveness.

Page 7, Lines 19-20: This seems like a pretty big assumption, considering that other studies have suggested year-to-year variability in tidal response.

Page 8, equation 3: Double check this equation. I’m pretty sure that  $V_{los}$  and  $dh/dt$  should be swapped.

Page 8, Line 17:  $dh/dt \sim 0.1 \cdot \text{tidal rate}$  in the melange due to buoyancy effects, and less than that for the glacier.

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