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Interactive comment on "Brief Communication: 2014 velocity and flux for five major Greenland outlet glaciers using ImGRAFT and Landsat-8" *by* A. Messerli et al.

Anonymous Referee #2

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The paper presents ice velocity analyses for 5 important Greenland outlet glaciers, using new feature tracking software (ImGRAFT) composed by the authors, and a new sensor (Landsat 8). The study reviews seasonal flow speed changes for the glaciers.

I have to apologize for the brevity of this review – I had a longer text composed, but in some filing and re-organizing after the AGU rush, I lost the nearly completed Word doc with my notes. I think I have captured the main issues from memory here. The short statements are not meant to be rude.

The purpose(s) of the study appears to be to show that Landsat 8's acquisition rate is capable of monitoring seasonal flow speed changes (perhaps) even though it is an

optical sensor – and that Landsat 8 data coupled with modern feature tracking software can rival InSAR in mapping details of ice flow. This is not stated clearly.

The Introduction is fairly good.

On the Method – Feature tracking is based on image-to-image cross-correlation – this is not made clear here (the word 'matching' is used). Citation of the TC paper on ImGraft is done, but no citations to some of the earlier work is made (IMCORR, COSI-Corr, MIMIC) - this would give a reader a path to understanding how this works and its history.

The feature tracking process has several parameters – source sub-scene size, target area size, and grid spacing - these are important parameters in setting the resolution of the subsequent map, and therefore are related to the errors; sub-pixel matching if used generally has a scale (step size of the sub-pixel fit), also related to error.

[In ImGRAFT - seems to be a problem with Figure 4 there – major velocity variations shown in Fig4 are sitting side-by-side. Also, I suspect that panels 4b and 4d are swapped?]

It is also necessary to note if the center of the displacement vector is used versus the vector tail (starting center point of the source sub-scene). While this is often not a major issue for short intervals, here you have glaciers that can flow over 500 m and up to a kilometer between image pairs – enough so that the strain field traversed by the tracked features becomes important.

On errors, a single value of ± 2 m/d is used, for the 16-day repeat pairs using the same path-row, a systematic error based on geo-location issues. However, adjacent (non-identical) path-rows were used, with time-separations varying quite a bit. The greater error with non-identical viewing geometry is mentioned, but without elaboration.

Error bars need to be shown in Figure 2 - and this will show that 2m/d error will blur quite a bit of the seasonal signal you appear to be mapping. Also, you could revise

Figure 2 to show the seasonal variation relative to the merged mean Landsat 8 velocity or to the InSAR mean. But I think this will point out the un-corrected errors you have in the Landsat 8 mapping.

Also on Figure 2 — should really re-design Fig2 for Niog. . . and Peterman – there's no detail visible, and a lot of white space.

On Figure 1, are the centerlines correct? picking centerlines with some of the data having systematic errors in flow direction is risky. The centerline for Niog. . . seems off? What is the background image? it appears to be a combination of Landsat and something else, perhaps something from the velocity map such as missing data points? Confusing as it appears as though nunataks are sitting within the ice stream in some cases (but this may be missing feature tracking data).

Analysis seems to focus on showing that the results are like those already reported by other studies, with the exception of the slightly greater flow speed for Jacobshavn (note that $\pm$2m/d makes this suspect). how about differencing the new map (perhaps the merged mapping from all Landsat 8 runs) with the InSAR data? would reveal errors, but might reveal evolution.

sorry again for the brevity.

Interactive comment on The Cryosphere Discuss., 8, 6235, 2014.