

Interactive comment on “Speedup and fracturing of George VI Ice Shelf, Antarctic Peninsula” by T. O. Holt et al.

T. O. Holt et al.

toh08@aber.ac.uk

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The authors thank T. Scambos for his constructive and informative comments, and for the mark-up of the original discussion paper. We respond to each comment below, and have made alterations to the manuscript based on the suggestions in the uploaded mark-up.

SC-TS 1.) I too noted the lack of features describing bottom crevasses, and would point to Luckman et al., and McGrath et al. studies of Larsen C shelf bottom crevasses. The current description is ‘pressure ridges’ and the word ‘buckling’ is used – this is unlikely for ice shelves.

AC: This has been partly addressed in response to M. Pelto’s short comment: We

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have added reference to basal crevasses in Section 4.2.2, 5.1.2 and Table 1, that now highlight the possibility of basal crevasses in GVIIS, but we do not specifically attribute individual crevasses/rifts to a formation mechanism.

Just to clarify: Here, we use the term ‘pressure ridge’ to describe features that distinctly raise above ice-shelf surface under compressive stress conditions, typically as the ice becomes grounded towards ice rises/rumples, the Alexander Island grounding line, and also at flow-unit confluences (see Collins and McCrae, 1985). We appreciate that in the manuscript the term ‘buckling’ is misused, and instead refer to the ice shelf as ‘thickening’ under compressive stresses in the revised paper.

SC-TS 2.) And I think ‘fractures’ should be dropped, and leave it at crevasses and rifts. The features in the northern ice front area that guided the series of larger retreats are almost certainly ‘rifts’ with thick infill of fast ice and snow and possibly melange.

AC: Again, this has been partly addressed in response to the short comment by M. Pelto. In the revised manuscript we refer to all fractures and rifts as ‘rifts’, but distinguish between those that contain water and or an ice melange from those that do not.

SC-TS 3.) In the discussion, the description of the likely future evolution moves toward the possibility of hydrofracture, and I agree with the future possibility of that, but the conclusion does not bring this scenario to the fore at all.

AC: Point 1 in the conclusion has been amended to include the following statement:

“However, we do expect continued recession through discreet calving events, which, coupled with a northward expansion of the meltwater limit, raises the possibility of hydro-fracture-driven retreat at this northern margin.”

SC-TS 4.) I think that contours of ice thickness should be included on Figure 8 - from Griggs and Bamber to make it simple (since the ICESat analysis here was a relative thickness change mapping).

AC: The authors agree that the thickness should be shown. We have added the Griggs

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and Bamber (2011) thickness data as a raster behind the ICESat elevation changes to Figure 8.

AC additional comments: In your attached mark-up there were several comments that we would like to address here also, by way of acknowledgement.

1) For the InSAR derived velocities we have since estimated tidal displacements for the northern section of GVIIS using the CATS2008a model, adjusted both the ascending and descending interferograms accordingly before recalculating the vector fields. 2) Figure 9 – you suggested that this may be removed in place of a text discussion, but the authors feel that this figure highlights the changes in the distribution and extent of the rifts and fracture traces more clearly than a text description would. 3) Table 1 – References have been added to the table where appropriate, and the descriptions have been amended in light of your comments – thank you.

Interactive comment on The Cryosphere Discuss., 7, 373, 2013.