

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

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The authors thank Anonymous Referee #1 for the positive comments on the manuscript, and for the suggestions of future research. Responses to each of these comments are below.

RC#1: 1. Can anything be said about the style of calving for the various periods of ice-front retreat discussed for both the North and South ice fronts? Is it possible to say whether any of these ice-front calving events were “Larsen B style”? Were there discrete tabular icebergs (e.g., named icebergs using the National Ice Center of the US naming scheme?) produced that were subsequently tracked, or were the calving events “quiet and unseen,” not bringing attention to themselves?

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AC: The temporal resolution of the imagery used here makes it difficult to fully assess the style of calving along the North or South ice fronts. However, where calving events are captured in the data that we do have, there is little evidence to suggest that “Larsen B style” calving events occurred during the retreat of the north or south ice fronts; they indeed tend to be “discreet” rather than “discrete”. As this falls into an area of future research, the authors have not altered anything in the final manuscript.

RC#1: 2. The increase in fracture density for the southern ice front region is very interesting. Is it possible to give a sense of what proportion of these fractures may be through cutting? ... ditto for what kinds of dimensions these fractures would have in the way of length and separation? ...

AC: These are interesting questions and are certainly areas for further study. In the discussion paper we used the term ‘rift’ to distinguish between those fractures thought to be through-cutting and those which were not (otherwise identified simply as ‘fractures’). This was done on the basis that the ‘rifts’ had water present between the walls of the rift (which was inferred to be sea water) or an ice melange. A lot of these through-cutting rifts are chaotic in formation and appearance, especially those that form near the grounding zone or near the various ice rises at the South ice front. Consequently, the rifts do not always have a measurable dimension, length or separation. There is certainly scope, however, to analyse the dimensions, length and separation of those rifts/fractures that tend to form towards the centre of the ice shelf and towards the ice front; they tend to be less chaotic, more regularly spaced and remain ‘open’ towards the ice front. (In the historical Landsat images, these rifts tended to heal down ice with compressive flow, but in more recent imagery (2010-present) it is clear that more and more rifts are remaining open and progressing further into the ice shelf from their grounding line position... this in itself is an interesting feature which can be further studied; no amendments to the manuscript have been made here in light of this comment, however)

RC#1: 3... Were there similar increases elsewhere, or was the opportunity to study

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the fracture density elsewhere not possible?

AC: No similar processes were observed on GVIIS. Indeed, at the north front, there appears to be a decrease in fracture extent and distribution, largely as a consequence of the ice-front retreat and the atypical dynamics of the shelf in George VI Ice Shelf. The reduction in fractures/rifts at the northern ice front is briefly mentioned in Section 5.1.1: As this point was made in light of further research the authors have not added anything to the manuscript, but agree that there is scope for assessing fracture density and extent over much wider spatial scales.

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

TCD

7, C283–C285, 2013

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