

## ***Interactive comment on* “Changing pattern of ice flow and mass balance for glaciers discharging into the Larsen A and B embayments, Antarctic Peninsula, 2011 to 2016” by Helmut Rott et al.**

### **Anonymous Referee #1**

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Review of Rott et al., TCryoD : Changing pattern of ice flow and mass balance...  
Larsen A and B...

The paper presents the results of a new analysis of elevation change and flow speed change for the eastern Antarctic Peninsula from Sjogren-Boydell glacier to Leppard Glacier, spanning the major outlets on the mainland Peninsula that were affected by the loss of ice shelves in 1995 and 2002. The study shows that the systems have moved in a positive direct in mass balance (either less negative, or positive outright) in the past few years. They attribute the decline of loss rate to the persistent presence of fast ice in the embayments.

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This is a very clear and well-written study, with a lot of good (accurate) new data to offer. It could be published as it is. It provides a 'next chapter' in the monitoring of this rapidly-changing region impacted by ~25 years of very warm conditions (1980-2006) which have tapered to slightly cooling over the past several years (still warmer than the mid-20th century by a considerable amount). Even at this point, two decades past the ice shelf disintegrations, the glacier systems still show short-term changes in both elevation and flow speed.

Attribution of the reduction in ice losses (less negative mass balance, and in some cases a switch to positive mass balance) is given to a reduction in calving flux – i.e. a downstream movement of the calving front. This in turn is attributed to persistent fast ice.

Minor comments follow. I would encourage the authors to adopt a consistent sign convention for mass budget / mass balance, i.e. negative means ice mass leaving the system. Although there is not a great deal of ambiguity (the words and numbers match the meaning everywhere I have checked), in places one wonders if a positive 'loss' might mean a net gain or a net loss, etc.

L22 please use 'mass budget method' rather than 'input-output' method. Note that IMBIE-2 has now adopted this phrasing. L32 no need to preface the mass budget results with 'Bn =' – it's a bit confusing, since you have not introduced that variable name, and not necessary. Also – L34 a 'mass loss' for a glacier losing mass would be –positive- : these are mass balance results, so negative numbers already mean 'loss'. A picky point, but this has been made strenuously by other authors/speakers. L41 this 'sea ice cover' was/is 'landfast ice' – another picky point perhaps, but an upcoming paper will discuss this buttressing, and fast ice is a much better buttress than typical sea ice. L68 here 'loss' is positive, as it should be with the phrasing; but better to stick to one numerical convention, positive or negative, and use words accordingly. It looks as though the majority of the Introduction uses positive numbers to report 'mass loss', and that is appropriate. However, it might be a bit confusing to people, since in

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terms of ‘mass balance’ these numbers should all be negative. In any case, please be consistent throughout the paper (abstract differs from main text). See L89-L100 and elsewhere. L76 change to ‘...began to accelerate and thin...’ (‘get thinner’ is a bit colloquial, almost slang) L154 ‘data takes’ is also a bit colloquial; ‘swath data’ or ‘data acquisitions’? L162, L165, L166 I think that “Raw DEMs” should be “raw DEMs” in English convention. L173 change to ‘...data from the Antarctic Peninsula DEM...’ L181 ‘swaths’, not swathes (in US English at least) L219 remove ‘anywhere’, and change to ‘back-slope areas’ - this is slightly confusing on first read. L254-255 – the RMSD is somewhat high, 50 – 60 m/yr, though, a bit of a concern. L260 again, please change to ‘mass budget method’. L297 ‘...approximately in a balanced state...’ ; Same Note for L365. L311-312 see comment re Figures 3 and 8. L510-513 – it would seem that several of the longer, thinner glaciers are evolving toward the Crane pattern of elevation change – the DBE system as well as Sjogren Glacier; and in the latest mapping, Jorum and HG are in this pattern. This is a clue / insight into how other glaciers that experience a sudden reduction in backstress at the grounding line might evolve in the future. Figure 2, Figure 7 – just a suggestion, make blue lines thicker, green lines thinner, to emphasize that the elevation change profile is the main point of the graphics. At first I thought the green line was binned elevation change rate (not area). Figure 3 – This graphic might be more effective as: (a) Speed, m/d, 2016; (b) Speed, 2016-2011; and Speed, 2016-1995 – same note for Figure 8. This would highlight the slowing in recent years. Also, check, is the date for the 1995 mapping November, as written, or October, as in the following figure profiles? Figure 4 and Figure 9 – Would it be possible to show the progression of speed versus time for the centerlines of the speed data – for example, in Figure 9, make the cross-section speed profile more narrow and place a center-line speed versus time graphic to the right of the plots? Similarly with Figure 4. Also – please place the location of the Fig9 flux gates and the Fig4 centerlines on one of the map views. I see that they are in the Supplemental Information, along with others, but it would be good to have these few in the main text maps to go with the figures.

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