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Interactive comment on "Evolution of surface velocities and ice discharge of Larsen B outlet glaciers from 1995 to 2013" *by* J. Wuite et al.

J. Wuite et al.

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COMMENT: Review of Wuite et al, The Cryosphere Disc. The paper describes a series of ice velocity mappings of the Larsen B tributary glaciers, and flux gate estimates of their outflow for 1995 and a series of measurements since then, mainly post-2002. The authors conclude that all the glaciers are moving much faster than their 1995 rates, and that wide-embayment glaciers (e.g., Hektoria-Green-Evans) have had a series of accelerations and partial decelerations. This is a very good observational study – well presented, well referenced, and well written. It deserves to be published. There are really no major weaknesses here. However, interpretation of the results is somewhat cursory. I assume that with this manuscript out, future papers will be able to use the data presented here to understand the system and explain it, or model it, better. REPLY: We

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Interactive Discussion
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thank the reviewer for his comments and suggestions, below you find our response to the review. We hope this and the adjustments in the text clarify the manuscript. The velocity products generated during this study will be made available soon for the wider scientific community through our project website at: http://glacapi.enveo.at/

COMMENT: The statement on 6278 L13-L18 is significant, but not supported, not that I can see –If there is truly evidence of summer seasonal acceleration, it should be highlighted with a clearer figure, and if a case can be made for sea ice backstress, it should be shown, or the statement should be retracted. This potential for seasonal variability has been talked about quite a bit. It would be plausible because of the similarity in climate to areas of the Greenland coast. There has been speculation about either summer melt percolation or fast ice back-stress, but no clear evidence that I'm aware of. If you have it, that would be a nice addition to the paper. REPLY: Based on the comment we checked again the velocity time series. The velocity variations for the glaciers in the study area are clearly dominated by multi-annual trends triggered by ice shelf disintegration of the northern and central sections of Larsen-B, respectively the weakening of SCAR Inlet ice shelf. Based on a time series of 22 TerraSAR-X image pairs we observe a signal of seasonal acceleration by several per cent on Crane and Jorum glaciers, but not in every year. Compared to the longer-trend this signal is rather modest. We revise the text accordingly.

COMMENT: The data for Flask, Leppard, Starbuck, and the Scar Inlet shelf area is interesting, and clearly shows a system in slow-motion transition, adjusting to the loss of the main Larsen B backstress. The development of sharper shear margins, and the tension cracks on the eastern side of Scar Inlet, suggest that no further change in climate or ocean conditions may be needed for this area to rapidly calve away the current shelf and initiate the same kind of rapid acceleration and thinning seen for, e.g., Crane and Jorum post-2002. This should be stated more broadly in the conclusions (the current statement is one sentence). REPLY: Thanks for pointing out the interest in the observations of the SCAR Inlet area and the suggestions. We strengthen these

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issues in the discussion and conclusion sections.

COMMENT: Error bars should be shown for the different missions, especially for Figures 6 and 7, where they would be more obvious (and some note on Figure 3 that they are comparable or smaller than the line thickness). Rather than clutter up these nice clear graphics, I think a set of example errors for the different velocity mappings, next to the color / mapping legends, would be adequate. REPLY:The error bars have been added to the figures.

COMMENT: Similarly, Table 2 shows clearly that errors are large enough that reporting mass flux to 0.001 Gt/a is unnecessary, and in fact nearest 0.1 to 0.05 Gt/a is all that is justified. REPLY: We agree, Tables 2 & 3 are adjusted in the revised manuscript.

COMMENT: I would like to see a figure similar to Fig3 and Fig6 showing Mapple, Pequod, and Melville Glaciers, and perhaps Punchbowl and Starbuck. I'm quite surprised at the rather large velocity increase reported for MMP. Elevation decrease was relatively minor for these glaciers in the 2000's. REPLY: The velocities and the mass turnover of these glaciers are rather small. Acceleration is confined to the lowest few kilometres of the terminus. This explains why the increase of ice export and the resulting mass deficit after ice shelf collapse have been rather small. We provide additional details on the velocities of these glaciers in the text, and add a figure with velocity profiles. The acceleration was highest at Melville Glacier whereas Starbuck Glacier did not accelerate (see velocities in Fig. 7).

COMMENT: Have a look at compilations of the marine bathymetry published in Lavoie et al (The Cryosphere Discussions, discussion closed) – this may help extend the kinds of observations / speculations made regarding Crane Glacier to others in this study. REPLY: Thanks for this suggestion. The information in this publication on the location of troughs in the Larsen B embayment supports our conclusion on small mass turnover of MMP and Starbuck glaciers (no deep troughs) versus deep troughs in front for Crane, HG, and centre of Scar inlet IS (downstream of Flask and Leppard glaciers).

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COMMENT: 6272 L17 – change to . . . their discharge was 38% and 45% respectively, higher than in 1995. REPLY: Changed

COMMENT: 6279 L8 – change ‘since’ to ‘for’ for an American or British ear, at least. REPLY: Changed

COMMENT: 6287 L9-10 ‘intermitted is awkward to a U.S. ear (eye). REPLY: Changed to “alternated with”

Interactive comment on The Cryosphere Discuss., 8, 6271, 2014.