

Interactive comment on “Frontal ablation and temporal variations in surface velocity of Livingston Island ice cap, Antarctica” by B. Osmanoglu et al.

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We give below a partial answer to Reviewer 1’s arguments about our paper, and will give a complete answer to both reviewers upon the availability of the second review.

1) We essentially agree with the arguments of Reviewer 1 in that the uncertainties involved in our estimates are large. In fact, this was clearly stated throughout the paper.

2) However, we note that these uncertainties, even if large, are analyzed and quantified in our paper. We will, of course, try to reduce some of the uncertainties, and improve/complete some error estimates, in the line suggested by the reviewer.

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3) Even if the uncertainties are large, we believe that its better having some approximate knowledge (but with quantified uncertainty) than having almost no knowledge. All global/regional-scale projections of glaciers outside the ice sheets completely ignore mass loss by calving, including all those in IPCC (2013). This is due to the inherent difficulty to model calving but also due to an extraordinary lack of data on the magnitude of calving of these glaciers outside the ice sheets. For the first time, due to the recently completed Randolph Glacier Inventory (Arendt et al., 2013), we know that 37% of all glacier area (outside the ice sheets) drains through marine-terminating glaciers, and this number increases to 99% for the glaciers around Antarctica. However, knowledge about the relative importance of calving is scarce, and this is particularly true for the glaciers and ice caps in the Antarctic periphery. Hence, it is very important that more information is made available about this possibly large component of mass loss; so there is much value in estimates such as ours, even though they may still be rough.

4) Regarding the reviewer's concern about the availability of ice-thickness data for tuning the model parameters (sliding parameter and flow law enhancement factor), we note that these data, though not abundant, are not scarce. In particular, concerning the lack of ice-thickness data near the calving fronts, the data are not just limited to Johnsons Glacier, but the GPR profiles in the western part of the island have also several branches approaching the calving fronts. Moreover, the different flow regimes (mostly related to proximity to the calving fronts) are taken into account in our tuning of the model parameters through the separation in fast/medium/slow flow regions, which resulted in halving the rms misfit between modelled and observed velocities as compared with the case where a single island-wide fit of the model parameters was done.

Reference: Arendt, A., et al. (2013). Randolph Glacier Inventory [v3.2]: A Dataset of Global Glacier Outlines. Global Land Ice Measurements from Space, Boulder Colorado, USA. Digital Media.

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