**Grounding-line flux changes due to flow of surface meltwater across Antarctic ice shelves**

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Ice shelves buttress upstream grounded ice, modulating the flux of ice across the grounding line, *q*. In West Antarctica, *q* has increased in response to ocean-induced ice-shelf thinning (e.g., Rignot et al., 2019). Surface melting can also affect ice-shelf thickness, with meltwater forming in one location and flowing down-glacier, where it usually refreezes. We aim to quantify the potential impact of these meltwater-driven thickness changes on grounding-line flux under present-day climate conditions.

We use the Reference Elevation Model of Antarctica (Howat et al., 2019), surface melt rates from RACMO2.3 (Van Wessem et al., 2018), and a surface routing algorithm (Schwanghart et al., 2014), to compute annual thinning and thickening resulting from drainage within individual surface basins. The impact of such mass redistribution on *q* is assessed with buttressing flux response numbers (BFRN). Using an ice-sheet model, Reese et al. (2018) thinned portions of Antarctica’s ice shelves and calculated the resulting changes in *q*. They defined the BFRN as the ratio of the immediate change in *q* to the volume removed from the ice shelf. Assuming a linear response to ice-shelf thickness changes, we multiply the annual thinning and thickening fields by the BFRN field and integrate spatially to assess the net impact on *q* of drainage in each basin.

Three impacts are possible: (i) where BFRN is uniform, the net change in *q* is zero, (ii) where meltwater moves from low to high BFRN, or across the grounding line, buttressing increases and *q* is reduced, and (iii) where meltwater moves from high to low BFRN, *q* is increased.

Preliminary results suggest that these responses will be small but non-zero, because BFRN varies on length-scales comparable to the length of drainage systems. Specifically, drainage systems often move water from near the grounding line, where BFRN is typically high, downstream to lower BFRN regions, resulting in increased *q*. Future work will examine how this will change if melt rates increase this century as predicted (e.g., Trusel et al., 2015).

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