Supporting Information for "Modeling tabular icebergs coupled to an ocean model"

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Introduction The supporting information contains a description of the experimental setup used in the tabular iceberg experiment.

Five movies have been included which show results from the fully coupled (S1, S2, S5) and ice-only (S3, S4) simulations.

Text S1.

The experiment configuration used to initialize the calving-tabular-iceberg simulation (in this study) is the same as that of the Ocean0 setup in the Marine Ice Ocean Modeling

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Inter-comparison Project (MISOMIP) [Asay-Davis et al, 2016], with the following three changes made:

1. The 'calving criteria' used in the MISOMIP study (which states that all points in the ice shelf with thickness less than 100m are set to zero thickness) has not been used.

2. The ice shelf has been thickened on the flanks of the domain, so that the latitude of the grounding line increases away from the center of the ice shelf.

3. The ice shelf is configured to be symmetric about its meridional center line ($x = \frac{L_x}{2}$). This was achieved by using the average of the left and right flanks of the ice-shelf thickness.

These three changes were made in order to make the circulation beneath the ice shelf easier to interpret.

Movie S1. Results from the Tabular-Iceberg-Calving control simulation: The upper panel shows the sea surface temperature during the simulation. Grid cells with ice mass $> 10^4$ kg are plotted in white, with grey shading indicating thinner ice. The lower panel shows a y-z vertical transect of potential temperature. The iceberg is shown in white and extends into the water column. The dashed line in the upper panel shows the location of the vertical transect used in the lower panel.

Movie S2. Same as movie S1, except for the Iceberg-Splitting experiment. In this experiment all bonds which initially intersect the line $x = \frac{L_x}{2}$ have also been severed. This effectively cuts the large tabular iceberg into two halves.

Movie S3. Results of an uncoupled (ice-only) simulation with no bonds between ice elements. Ice elements are initialized throughout the domain. The elements are forced by an imposed westward ocean current of u=0.1m/s (no ocean model is used). Forces due to sea surface slope, atmospheric drag, Coriolis and sea ice drag are set to zero. The size of

the dots shows the surface area (and interaction radius) of each ice element. Land points are shown by black circles.

Movie S4. Results of an uncoupled (ice-only) simulation using bonds between elements. Ice elements are initialized throughout the domain. Three tabular icebergs are included, with 25, 16 and 4 elements respectively. The elements are forced by an imposed westward ocean current of u=0.1m/s (no ocean model is used). Forces due to sea surface slope, atmospheric drag, Coriolis and sea ice drag are set to zero. The size of the dots shows the surface area (and interaction radius) of each ice element. Bonds between ice elements are plotted in magenta. Land points are shown by black circles.

Movie S5. Same as movie S1, except for the Bond-free experiment. In this experiment all bonds have been severed.

References

Asay-Davis, X. S., S. L. Cornford, B. K. Galton-Fenzi, R. M. Gladstone, G. H. Gudmundsson, D. M. Holland, P. R. Holland, and D. F. Martin (2016), Experimental design for three interrelated marine ice sheet and ocean model intercomparison projects: MISMIP v. 3 (MISMIP+), ISOMIP v. 2 (ISOMIP+) and MISOMIP v. 1 (MISOMIP1). *Geoscientific Model Development* 9, no. 7: 2471.