

Treatment of grounding-line dynamics in ice sheet-shelf models

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Previous model intercomparison tests with dynamical ice sheet-stream-shelf models have found that the treatment of grounding-line migration is critical, and can spuriously affect results even in simple idealized situations. Recent theoretical advances (Schoof, 2007, *JGR-Earth Surface*) show that it is necessary either to resolve the transitional boundary layer upstream of the grounding line, or to apply analytic constraints on the ice flux flowing across the grounding line.

Here a marine ice sheet-shelf model is used to simulate grounding-line migration in simple 1-D flowline scenarios. Results are compared using fine (0.1 km) and coarse (10 km) grids, and also using the Schoof grounding-line constraint embedded within a coarse grid. It is found that all coarse-grid results using the Schoof constraint agree very well with those using fine grids. We conclude that in order to correctly simulate grounding-line migration, large-scale ice models need to use either very fine grids (~ 0.1 km) that resolve the grounding-line boundary layer, or coarse grids with embedded constraints at the grounding line following Schoof (2007).