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Grounding line behavior in a heuristically coupled ice sheet-shelf model

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Standard equations for large-scale ice-sheet and ice-shelf flow are combined into one set, that includes grounded and floating regimes yet is numerically less expensive than full-stress models. The combination of the scaled equations is heuristic, but allows both horizontal shear and longitudinal stretching without *a priori* assumptions about the flow regime, and grounding lines are free to migrate. The equations are solved iteratively at each time step, and the type of flow depends primarily on bed type via the basal shear stress.

The model is applied to basic aspects of grounding-line behavior, using idealized 1-D flowline geometries in which grounded inland ice flows into a marine ice shelf. Even in idealized cases, there are still fundamental unresolved issues regarding grounding-line sensitivity to sea-level change and bed properties, and the existence of multiple steady states. These and other issues are addressed in series of sensitivity tests, and results are discussed in the context of previous work and relevance to the West Antarctic Ice Sheet.