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On the effect of ice-shelves melting on the grounding line dynamics

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Mass balance of marine ice-sheets is mostly controlled by the movement of their grounding line, the line between the grounded and the floating part of the ice mass. Recently, important theoretical progresses have been made to describe the dynamics of the grounding line, allowing a model intercomparison benchmark to be built (Marine Ice Sheet Intercomparison Project, MISMIP). For the sake of simplicity, melting of the lower surface of ice-shelf have been neglected in the MISMIP experiments. This may be misleading as melting is known to be large in the vicinity of the grounding line (tens of meters per year). We will investigate the effect of melting on the dynamics of the grounding line through a 2D full-Stokes modeling study. The sea-ice interface is treated as a free surface submitted to the buoyancy sea pressure and the starting point of this surface (i.e. the grounding line) is determined by solving a contact problem. The full-Stokes equations, the air-ice free surface as well as the sea-ice free surface equations are solved in a coupled way with the finite-element code Elmer. More particularly, we will check whether the generally admitted assumption, which stipulates that enhancement of basal melting leads to grounding line retreat, is appropriate.