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Advanced ice sheet modeling: Parameter estimation for grounding-line transition

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Ice sheets and ice shelves are linked by the transition zone, the region where the grounded ice lifts o the bedrock and begins to oat. Adequate resolution of the transition zone is necessary in order to obtain numerically accurate ice sheet-ice shelf simulations. How high a resolution the transition zone requires depends on how the basal physics is parameterized. Schoof [2007] proposed a step function basal friction parameter: basal shear stress is nonzero in the ice sheet, but abruptly falls to zero in the ice shelf. This model has the drawback of not transitioning smoothly between grounded and floating ice, essentially requiring infinite resolution in the transition zone. In order to remedy this problem, Pattyn et al. [2005] proposed a smooth basal friction parameter, which asymptotes to zero as the ice flows across the grounding line into the ice shelf. This led to promising results with a resolvable transition zone, but their parameterization introduces an arbitrary length scale into the problem, and the basal friction term remains nonzero (though small) in the ice shelf. In this poster, we propose a new parameterization of the basal shear stress in a 1 dimensional vertically integrated model that provides a physically motivated, smooth transition between finite basal friction in the ice sheet and zero basal friction in the ice shelf. With the new parameterization, we are able to diagnose the length scale of the transition zone.