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On the impact of buttressing on numerical ice sheet models.

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Idealized problems with little or no lateral variation are frequently used to study numerical ice sheet models that are then applied to realistic problems that have substantial lateral stresses. Given that the strong lateral variation can, for example, result in a stable grounding line on retrograde slope - an impossible result otherwise - it seems unwise to assume that any conclusion drawn from an unbuttressed flow-line geometry can be extrapolated to the general case. We will present results from two problems which do involve significant lateral stresses, the idealized MISMIP+ tests and 1000-year simulations of the entire Antarctic ice sheet, both resolved to sub-kilometre spatial resolution with the BISICLES ice sheet model. We will consider some numerical issues – for example, whether sub-grid friction schemes are as useful as they appear to be in flow-line problems. We will also consider the impact of the Coulomb limited basal traction law proposed by Tsai (2015), which results in flow-line marine ice streams that are more sensitive to climate perturbations than with the usual Weertman law: to what extent does that hold true in buttressed ice streams?