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Interactive comment on "The stability of grounding lines on retrograde slopes" *by* G. H. Gudmundsson et al.

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This is an interesting and necessary paper that confirms the results of several studies using flowline models with parameterized lateral drag, namely, that ice streams/shelves flowing through relatively narrow channels can generate enough lateral drag to permit a stable grounding line on an inland-deepening bed.

I will leave detailed technical comments to the referees. Instead, I would like to comment on the authors' summary of Dupont and Alley (2005), which is not entirely accurate. The authors state that in DA05, "the degree of ice-shelf buttressing at the grounding line was in effect prescribed through a side-drag parametrisation". However, DA05 prescribed buttressing at the grounding line through a boundary condition at the downstream end of the domain. This BC used a buttressing parameter ranging from 0

(for an unbuttressed ice front with the only backstress provided by hydrostatic pressure) to 1 (for a fully buttressed condition in which the ice shelf provides enough backstress to force zero strain rate at the grounding line). This was a reasonable way of handling ice-shelf buttressing, given that the objective of DA05 was to investigate the effect of sudden ice-shelf removal (as in the Larsen B collapse) on a tributary ice stream, using a model that included longitudinal stress. The buttressing parameter thus represented the effect of an ice shelf not explicitly included in the domain. The ice stream in DA05 was also subject to parameterized lateral drag based on a boundary-layer theory; the results of Goldberg et al (2009) [already cited by the present authors] support the accuracy of this parameterization. The comment by the present authors that "It is unclear what three-dimensional geometrical configuration, if any, gives rise to the type of prescribed side drag used by Dupont and Alley (2005) in their example" is thus puzzling and unduly negative.

Once again, I do think this is an interesting study that merits eventual publication, but I would like to see a more accurate assessment of DA05 in the final version.

Interactive comment on The Cryosphere Discuss., 6, 2597, 2012.