General remarks

"The sensitivity of flowline models of tidewater glaciers to parameter uncertainty" by Enderlin et al. describes, as the title implies, the sensitivity of a flowline model to uncertainties in the enhancement factor, the rate factor, and the exponent in a Weertman-type sliding law. Initial steady-state configurations are obtained for a range of parameters. A step change (doubling) in submarine melting is used to initiate the prognostic simulations. The study finds that, for reversed bed slopes, small differences in ice temperature (and thus the rate factor) determine whether the glacier retreats unstably or not.

In Enderlin et al. (2013), which appeared earlier this year in The Cryosphere, the authors, using the same model, explored the sensitivity of tidewater outlet glaciers to glacier geometry. The manuscript under review is therefore a natural follow-up. The study is solid though not over-exciting. The manuscript is well structured, carefully written, and deserves publication. Since the depth-integrated flowline model has been already used in a number of previous studies, the model description given here is sufficient; I thank the authors for not wasting multiple pages explaining a model and equations I already know, or can at least easily look up elsewhere.

The introduction claims to investigate the model sensitivity to three parameters, namely the the enhancement factor, the rate factor, and the sliding law exponent. In a depth-integrated model, however, the effect of the enhancement factor and the rate factor are essentially the same as they are multiplicative in the equation for viscosity. A doubling of the enhancement factor from 1 to 2 has roughly the same effect as a change in (depth-averaged) temperature from $-6\,^\circ$C to $-2\,^\circ$C? I believe this can be seen in Fig. 2 (middle panels: Red solid line ($E = 1$, $T = -2\,^\circ$C, $m = 1$, upper panel) and blue solid line ($E = 2$, $T = -6\,^\circ$C , $m = 1$, lower panel). I would expect that these simulation behave similarly, but Fig. 6 only shows results for $E = 1$. In other words, the study effectively covers only two instead of three parameters. I understand that it would be less convenient to discuss the sensitivity in terms of an effective factor $\mu = EA(T)$, however to entangle the two, a depth-dependent flow model is needed (e.g. to study the effect of cold-ice advection as apparent in Fig. 7 in Lüthi et al. (2002). If the authors prefer to stick to the three parameters, I suggest to at least discuss this more carefully. What role play other parameters like choice of sliding law, parametrization of effective pressure, and surface mass balance, to name a few?

Technical comments

p. 2568, l. 2: "predict future" sounds like a tautology to me. I suggest to remove "future".

p. 2568, l. 3–4: The sentence implies that a physically-based calving criterion only exist for flowline models. Rephrase.

p. 2573, l. 23: Change "warmer" to "higher". Values cannot be warmer or colder only higher or lower.

p. 2574, l. 2: Side note: In cold-ice models, the rate factor also accounts for additional softening in temperate ice.

p. 2577, l.3: Remove "dynamic"

p. 2579, l. 14, 22, 25: Change "warmer" to "higher"; "colder" to "lower".

p. 2581, l. 10; p. 2582, l. 6 and 24: Same suggestion as p. 2568, l. 2.

References

Enderlin, E. M., I. M. Howat, and a. Vieli (2013). High sensitivity of tidewater outlet glacier dynamics to shape. *The Cryosphere*, **7**(3), 1007–1015. doi: 10.5194/tc-7-1007-2013. URL http://www.the-cryosphere.net/7/1007/2013/.

Lüthi, M. P., M. Funk, A. Iken, M. Truffer, and S. Gogineni (2002). Mechanisms of fast flow in Jakobshavns Isbræ, Greenland, Part III: Measurements of ice deformation, temperature and cross-borehole conductivity in boreholes to the bedrock. *J. Glaciol.*, **48**(162), 369–385. URL http://openurl.ingenta.com/content/xref?genre=article&issn=0022-1430&volume=48&issue=162&spage=369.