

Interactive comment on “Improvements in one-dimensional grounding-line parameterizations in an ice-sheet model with lateral variations” by David Pollard and Robert DeConto

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Received and published: 24 June 2020

The paper presents improvements on a heuristic for grounding-line flux calculations in large-scale ice sheet models. The model initially participated in ice sheet intercomparisons focusing on ideal cases of grounding line behaviour and these published results are now used to improve the algorithm dealing with grounding line motion. The paper definitely valorises the benefit of model intercomparisons that often point to discrepancies or even model errors in some cases. The paper is well written, easy to understand and to follow. However, the paper is technical and therefore of interest for modellers dealing with such type of parameterisations. I would suggest to enlarge the scope a bit

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in the introduction and explain in some more detail the reasons why such algorithms are necessary, what their advantages and disadvantages are. It would also make a wider readership interested in the problems currently encountered in marine ice sheet modelling. I would also suggest to provide a sketch of the proposed simple algorithm for grounding-line direction calculation. Reading through it (page 3 and 4), I took pencil and paper and made a quick drawing. It helped a lot in my understanding.

I have one major remark/question: both improvements (the grounding line orientation and the weighting scheme on grid velocities) improve the model performance so that it fits within the overall group of models. To what extent is this a clever way of fitting your model to the other models? A way to shed a light on this is to perform the MISMIP3d experiment and compare the result with the same adjustments to the other participating models. As shown in Pattyn and Durand (2013) the heuristic model shows large advance and retreat of the grounding line compared to conventional SSA models at high resolution.

The description of the calculation of crevasse depths falls somehow out of the scope of the paper. It is a model improvement but keeps the attention away from the main message and evaluation of the algorithm. furthermore, there is no experimental work presented regarding this modification. I would suggest to leave it out and use it appropriately in a subsequent manuscript that employs the improvement (typically an appendix).

Minor remarks:

Figure 4: please use a different color scheme for the buttressing factor. It is far from obvious to distinguish the colors of the end-members. Why not a scheme similar to the one used in the left panel?

Interactive comment on Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2020-131>, 2020.

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