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The Cryosphere Discussions

Interactive comment on "Ocean forced evolution of the Amundsen Sea catchment, West Antarctica, by 2100" *by* Alanna V. Alevropoulos-Borrill et al.

Anonymous Referee #1

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The paper is a very well written and mostly well argued piece of work examining the likely response in ice VAF of the ASE area to future ocean warming, linked to RCP emission scenarios.

Whilst I do recommend publication with minor corrections, I would like to see a slightly expanded section (3.3) on how the ice shelf meltrates are derived and implemented in the ice model, in particular their choice of parameterization method.

Section 3.3

To clarify line 290.....would that be an extra 1m/a of melt for each 0.1 deg of temperature rise? And also that it is assumed that a warming in the ocean outside an (unmodelled) cavity will reach the grounding line unchanged?

The authors use a single, averaged mean temperature value for each model simulation to force melting on all ice shelves within the ASE. Is this a valid assumption? What is the spatial variability in oceanic conditions of the models like? Would we expect to see water with different properties entering different ice shelf cavities? Some further discussion of these points would be appreciated.

The length scale, lambda, used in the melt rate forcing has a length scale of 1000m. Is there any physical based justification of this? Is there also any reason to assume that this will be constant for all ice shelves within the domain?

The authors have used a relatively simple parameterization of melt rate that varies only with distance from the grounding line. Is there a reason they haven't used a more advanced method that would take into account changes in ice shelf basal slope? (for example a plume model such as Lazeroms et al 2018, or a box model like Reese et al 2018)

Smaller points and technical corrections

102-Is it a valid assumption that models are temporally consistent?

146 - Would it not make more sense to select models for the subset based upon their performance in the ASE rather than the Southern Ocean as a whole, given that this work is focused on the ASE.

212 How does the model deal with an advancing/retreating calving front? I assume it is held constant at the initilised position?

276 results of the

400 Pope,Smith and Kohler

500 Perhaps the discussion could also include mention of more advanced parameterization schemes?

Fig 2. The potential temperature axis seem to be labeled wrongly

References

Lazeroms, W. M. J., Jenkins, A., Gudmundsson, G. H., and van de Wal, R. S. W.: Modelling present-day basal melt rates for Antarctic ice shelves using a parametrization of buoyant meltwater plumes, The Cryosphere, 12, 49–70, https://doi.org/10.5194/tc-12-49-2018, 2018.

Reese, R., Albrecht, T., Mengel, M., Asay-Davis, X., and Winkelmann, R.: Antarctic sub-shelf melt rates via PICO, The Cryosphere, 12, 1969–1985, https://doi.org/10.5194/tc-12-1969-2018, 2018.

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