

Modelling GNSS-observed seasonal velocity changes of the Ross Ice Shelf, Antarctica, using the Ice-sheet and Sea-level System Model (ISSM)

I thank the authors for revisiting their study and tempering their conclusions. I believe the refocused discussion and conclusions now align more closely with their results and with other research on this topic. I have a few minor suggestions that I would like to submit to the authors for consideration.

Specific comments and (mainly) suggestions

Line numbers correspond to the “Author’s tracked changes” version

- Line 3: the comma placement seems a bit unusual; please consider revising.
- Lin 11: Suggested wording “Here, we investigate the potential role of basal melt variability on ice flow speed and use the Ross Ice Shelf a testbed”
- Line 20-21: consider rephrasing to “... on ice flow speed, the amplitude of the perturbation required to ...”
- Line 61: replace “;” with “and”
- Line 209: be sure to comment on the unrealistic refreezing that is applied in the sine function.
- Line 410: consider specifying what you mean by “... as has been done previously”. For example, in Reese et al. (2018) they also look at a local perturbation.
- Line 420-425: I suggest to better link the two with something like: “This can be explained by the loss of buttressing force triggered by the ice shelf thinning.”

The explanation of the impact of thinning on pinning points could be more detailed. Depending on the way you apply the melting, you may not lose any grounded area over Ross Island in your experiments. The loss of buttressing would therefore be due to a reduced thickness close to the pinning point and a decreased transmission of stresses from the pinning point to the rest of the ice shelf. This might not be clear in the text right now, as the reader might think that melting leads to a reduction of grounded area (which might be the case though).

If there is some unpinning, I think that it will only occur in ISSM if you apply melting at the first grounded node or if the thinning over the ice floating area leads to an increased advection of ice from a grounded area to a floating area (which, again, might be the case). This might be good to check in the outputs and to emphasize in the discussion.

- Line 510: This sentence nicely recaps the limitation of the experiments but is a bit long. Here is a suggestion to improve readability: “However, we highlight that if melt alone were responsible, and it occurred only in sensitive regions of the ice shelf, then a variability in basal melting with peaks of 20-80 m/a in April and October would be needed to match the GNSS observations at sites 1, 2 and 4.”
- Line 580: As in line 420-425, it might be good to specify the effect of ice shelf melting on pinning points.
- Line 588: “Therefore” is repeated from line 585. Consider rephrasing to avoid redundancy.
- Line 591: Remove the period at the beginning.

- **Specific comment on previous review:**

In the previous review I asked the following question: Figure A9: Why is the time going from 2040 to 2042? It would be interesting to align A8 and A9 to compare MITgcm melt rates in sensitive regions. Also, what is the meaning of the different colours and lines?

Which has been answered as follows: We chose 2040-2042 arbitrarily. This figure provides an example of the sinusoidal pattern, which is repeated throughout the years. We have decided not to include this figure, as we think A8 and A9 highlight the differences in phase well without needing to spend significant time combining the figures. Each coloured line represents basal melt at a different sensitive region (i.e., each node on the model mesh).

Thank you for the response. However, I believe combining Figures A8 and A9 or aligning their time axes would be highly beneficial to readers, as it would allow for straightforward comparison of MITgcm with the sinusoidal forcing. This seems logical to me and is little extra-work but I leave this decision to the authors.

Also, in your response, you mention that each color on the plot represents basal melt at different nodes of the mesh. Could you please include this information in the figure label for clarity?