

## ***Interactive comment on “initMIP-Antarctica: An ice sheet model initialization experiment of ISMIP6” by H el ene Seroussi et al.***

**Jesse Johnson (Referee)**

jesse.v.johnson@gmail.com

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This paper aggregates some 25 modeling results from 16 different groups in order to identify the variability in model results with respect to surface mass balance and sub-shelf melting in Antarctica. The results are important because they demonstrate that while models have similar results for surface mass balance anomalies, there is considerable variability for anomalies in sub-shelf melting. The important differences are likely due to differences in both how the models are initialized and how sub-shelf melting is parameterized in models. Hence, the paper reports on both the present state-of-the-art in terms of modeling, and it offers excellent suggestions for where modeling should go in the future if differences in modeling results are to be well understood.

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The contribution is novel in that, unlike previous "SeaRISE" efforts, 1) the forcing data sets are now consistent with AR5 rather than AR4 climate forecasts, and 2) a larger number of models are participating and the models have a greater sophistication in terms of how they treat the physical mechanisms responsible for grounding line retreat and floating ice.

Given the importance and novelty of the results, I encourage rapid publication of the manuscript. It is well written and the complex results are presented in an accessible way. While reading the manuscript, I did have a few ideas that might make results easier for readers to reason about. I know that assembling so many results is a massive undertaking, and that most important findings are already easy to digest, so I leave it to the authors to decide if my suggestions are worth pursuing.

\* page 1 line 35-36, even as a modeler I am not sure this is true. Let's not rule out semi-empirical approaches just yet. \* page 3, line 0-10 - this stages the problems very well. \* page 3, line 14 - I'm not sure you meet this objective. I'm not sure how high the bar is for 'enhance', but I finished the paper with plenty of questions as to what is responsible for the spread in results. Consider softening expectations? \* page 4, lines 8-15 Unlike the previous paragraph, which I finished with a good understanding of the basis for SMB anomalies, I finished this paragraph unclear about what the anomalies in sub-shelf melt were based on. You take the present day melt rates estimated in Rignot 2013 and Deporter 2013 and double them? Ok, but how are the two references reconciled? Average? Consider rephrasing the contents of this paragraph. \* page 8 - this table is at the center of a lot of what and how things that are to come are interpreted. Could the model names use the same color schemes as the figures to come. Also, DMI\_PISM and ILTS\_SICIPOLIS appear to be identical, at least according to the table. Could difference be noted here for clarity? \* page 9, figure 2 - minor, but this is a continuously varying color map being used to represent 25 different things. Maybe it would be more clear if there were 25 discrete colors? \* page 10, figure 3 - this is my most significant suggestion. It would be super helpful if the display of information

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were clustered by a possible explanatory variable. For example, here, I think that the lower RMSEs in thickness and velocity are due to a assimilation as opposed to a spin up procedure, but I'm too lazy to compare models to the table. If you had the results boxed off according to initialization procedure, it would invite readers to do more speculation about the causes of differences. As it is, one just sees that some models are different from others, without the ability to reflect on cause. This criticism applies of much of what is to come in terms of 'clustering' model results according to something; initialization procedure, sub-grid parameterization, interpolation, etc. \* page 10, figure 3 - I'm not sure I get much out of log \*speed\* (not velocity) as opposed to speed. \* page 11, figure 4 - mention in caption that negative is growing the ice sheet? \* page 14, figure 9 - I like this figure quite a bit. Again, clustering would help. \* page 16, figure 11 - would it be helpful to place this along side figure 9? It's an interesting shift in sensitivity. \* page 18, I really enjoyed the discussion, some strong points are made. However, I worry readers won't get this far. Consider a non-standard format of placing the discussion \*before\* the results? Probably a terrible idea, but the results do pacify the reader's attention.

Nice work pulling it all together.

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Interactive comment on The Cryosphere Discuss., <https://doi.org/10.5194/tc-2018-271>, 2019.