Review of tc-2014-165-slc-review

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1 General Comments

The original manuscript for this paper was criticised for its experimental design. Orginally, the Pliocene climate experiments started from a 'shrunken' East Antarctic Ice Sheet (PRISM), or from a modern geoemtry but with a climate determined for a 'shrunken' ice sheet, and reviewer 1 (DP) suggested that the outcomes might depend more on the initial geometry than a gradual change of climate. The authors have addressed this crticisim by inclusing an extra set of experiments, which represent a major effort. These apply the Pliocene climate to both PRISM and a soemthing like the present day ice sheet. The result seems to be that DP was correct : the results are determined by the initial condition as much as the climate. I think that is an interesting outcome and makes the paper suitable for publication. The authors do note, in both the abstract and conclusions, that this should be regarded as a shortcoming of the models.

My view on these kinds of simualations for some time has been that low resolution models (by which I mean, more than one or two kilometers) without special treatment simply cannot describe ice stream / grounding line dynamics, over any time scale, and with any accuracy. I think the results of this paper demostrate that point, and the modified abstract acknowledges that.

What is missing, in my view, is a one-or-two paragraph discussion of the reasons that the models disagree (there are some points made, but not all in one place). ANICE and SICOPOLIS, for example, seem to retreat more than readily PSU, despite PSU having a grounding line treatment. Maybe this is to do with other parameters, e.g the enhancement factors or the accumulation fields. Perhaps a future publication might address this by designing experiments with a more restricted set of parameters, e.g all use the same accumulation scheme, but I would like to see at least some discussion here.

2 Specific Comments

AISM-VUB is said to have taken part in MISMIP3d. So it did, but it was one of the models (like PSU) that imposed a grounding line flux derived from Schoof 2007 (Table 2 of Pattyn 2013 has two VUB entries, both labelled A-HySSA) . But Table 3 says 'no special treatment', so either the Table 3 is incorrect, or Pattyn 2013 is incorrect, or this is not the model included in MISMIP3D.

ANICE has 'Sub-shelf melting is calculated as described above, and only applied on floating ice'. Does this mean (a) only on grid cells whose center is floating or (b) on any grid cells that are partly floating. The difference is huge : (b) is an error that can dominate the results unless you apply extremely fine resolution.

Was the PISM sub-grid melt scheme (where melt-rates are imposed on the grounded nodes nearest the grounding line) used? Make a postive statement either way. Also, is the ratio of grounded to floating area not used to modify the basal traction coefficient (with modifications to the driving stress taking place through the one-sided difference)?