Review article **: Simulating the Antarctic ice sheet in the Late-Pliocene warm period: PLISMIP-ANT, an ice-sheet model intercomparison project**
By De Boer et al.

Detailled comments :

p. 5541, line 17 "*We include an overview ….how specific model configurations influence the resulting Pliocene Antarctic ice sheet*". I do not think that this point has been fully addressed, especially concerning the grounding line migration.

p. 5546, line 1. How does ERA40 compare with observations ?

p. 5546, line 10. Please add here the information that is given p. 5553, line 16. "*ocean temperatures are adjusted according with the depth of the bottom of the shelves*".

p. 5547. line 21 " I*n general velocities are underestimated by the SIA and overestimated by the SSA*"
It is not due to the approximation themselves SIA or SSA (BTW, Ma et al. 2010 paper was based on full Stokes experiments) but it is linked to the role of ice anisotropy acting differently in the case of shear stresses in the vertical plan (taken into account in SIA) and horizontal stretching (computed in SSA). So the objective to use different enhancement factors for SIA and SSA is a way, for a model with isotropic flow law, to approximate the effect of anisotropy and better compare with observed ice flow.

p. 5548. line 1 "*...own parameter settings for the thermodynamics, mass balance and ice flow as would be used for regular paleoclimate simulations*".
Basal boundary conditions are also crucial, please mention here that it is also part of the setup of a model and state how it was done in every model

p. 5550, line 17 "*Basal sliding is included as a Mohr–Coulomb plastic law*". Is the plastic law coefficient uniform over the ice whole continent ?

p.5551 line 16 "*that is in a Surface melting*" something missing ?

p.5551 line 24 "*such that shelves thinner than 250 m are automatically calved*". How does this method allow for a growing ice shelf ?

p. 5552, line 14 (Rimbay). "*RIMBAY is based on the 3-D ISM byPattyn(2003) and a full description is given in Thoma et al.(2014). RIMBAY combines SIA and SSA velocities in a similar way as PISM and ANICE*"

I am a bit puzzled by this description because Pattyn (2003) solves a 3D system for ice flow and the second part of the sentence is contradictory because combining SIA and SSA is a vertically integrated approach. I understand that RIMBAY is a multi-approximation 3D model, but that only the vertically integrated part has been used here. This point should be better stated.

Results

p. 5554. line 4 "*PSU-ISM (green), show a smaller initial increase in ice volume*". The small initial

increase could be due to the initialisation procedure.

p. 5554, line 16. *"Nonetheless, the topography and the extent of the ice shelves are rather similar compared to the PD initial ice sheet"*
This is rather wrong for PSU that extent substantially in the Ross sector. Was this model calibrated with ERA-40 ?

P 5556 , line 17 *"plotted ice sheet presence which shows how many of the six ISMs predict ice of any thickness in that particular grid box"* Is it for grounded ice or for any ice (grounded and floating ?)

p. 5559. line 9 *"Differences between model is largely due to the variability in ice fluxes, whereas the average SMB for the six ISMs is 2113.3 ± 129.7 Gt yr−1 (Gt = 1012 kg) and the ice flux across the grounding line is 346.5 ± 147.8 Gt yr−1 at the final step of each 100 kyr simulation"*
I do not understand. The ice sheet should be in equilibrium by this time so why are the SMB and ice flux so different ?

Figure 1. It is difficult to really see the differences between simulated climates, would it be possible to have the anomalies for surface temperature and precipitation (eventually in the supplementary material)

Figure 8. It would be easier to follow if each profile kept its name A,B,C from figure 7 and eventually A1, A2 for Control and Pliocene (rather than a,b,c,d,e,f)

Figure 9. It would be better to have maps of differences between bedmap1 and bedmap2

Figure 10. It would be good to have the grounded extent (2 more panels)