

A review of "ISMIP6-based Antarctic Projections to 2100: simulations with the BISICLES ice sheet model" by O'Neill et al.

In this manuscript, the authors conduct numerical simulations of Antarctic Ice Sheet using BISICLES, and investigate the impacts of climate forcing and model configuration (e.g., ice shelf collapse) on the model sensitivities. Overall, I think this study is a necessary follow-up of Edwards et al. (2021) and Seroussi et al. (2020), and is within the scope of The Cryosphere. The authors conducted comprehensive and detailed experiments regarding the uncertainties of the contribution of Antarctic Ice Sheet to sea level rise. In principle, I endorse its publication after the following questions are properly addressed.

L1-6: please complete the affiliation information

L32-33: I think it is probably better to say something differently between EAIS and WAIS if the SMB change pattern is different, which is inconsistent with the experiment design of this paper.

L34: remove extra space before "10 mm"

L44: remove extra comma after "models"

L58: put the sentence "BISICLES ISMIP6 ..." in a different paragraph and elaborate the reason you choose BISICLES for this study.

L81: I think you should also add Seroussi et al. (2014) along with Cornford et al. (2016) to represent the sub-grid GL scheme.

L85-86: Regarding " $m=1/3$ and Coulomb friction coefficient", I think you still need put some basic important equations here, like several equations describing the L1L2 approximations, and then you can properly get those model parameters settled somewhere.

L91: Regarding "the calving front is fixed", but there are also several experiments that you calve all ice shelves away, correct?

L114: it should be "...found in Jourdain et al. (2020)"

L130: extra space after "collapse"

L134: extra space between mm and a-1

L135: So the ice shelves are removed in a sudden?

L154: wrong citation format

L157: Fig. 3(b) -> Fig. 3b

L160: Fig. 3(a) -> Fig. 3a

Figure 3: please use white background for both Fig 3a and b.

Table 2: Looking at the Collapse On experiments here, it reminds me ABUMIP. Have you compare your results with that of ABUMIP? If not, I suggest doing some analysis. Also, the numbers at the "Sea level contribution" column are not exactly the same as in your following figures (e.g., figure 11), please check.

Figure 5 and 6: for y label, the unit is km²

Figure 8: in the caption: Basins are numbered as follows...

L268-270: I don't think this discussion is necessary here, as SLR is directly contributed by VAF and there is very complex relationship between basal melt of ice shelf and SLR.

Figure 10: For SMB, why are all ice shelves are missing? In addition, the spatial pattern here is not clear. Maybe you should try another way to plot them - maybe log scale?

L290: you do not have to mark "h" and "i" in bold here

L292: Fig. 4a

L294: you mean (27 mm vs 16 mm)?

L296: Figs. 4c and d

L305-312: I think you should say something about the two major ice shelves in WAIS, Filchner Ronne and Ross ice shelf. For example, does the basal melt of Filchner Ronne ice shelf increase nearly proportionally to that of Ross ice shelf?

L325-330: So can we get a conclusion that the buttressing of ice shelf can contribute a 20-30 mm SLR?

Equation 2: you still need to elaborate the meaning of each term in this equation.

Section 4.5: **This is probably the major concern of this study.** The analysis and figures here seems to be a bit overlapping with previous studies like Seroussi et al. (2020). I doubt if it is necessary to compare BISICLES with all other different types of models. Maybe you can just compare it with other higher order models, which I think makes more sense. Then it might be possible that you can put all comparisons in a single figure, instead of showing them similarly in 3 figures (14-16).

Figure 13: Please put the thermal forcing curves in a separate plot, which will make a clearer and nicer figure.

Section 4.7: It is not clear to me if you have done the hindcast experiment. Please clarify.