

We would like to thank the reviewers for their constructive comments that helped to improve the manuscript ‘The future sea-level contribution of the Greenland ice sheet: a multi-model ensemble study of ISMIP6’. We have revised the manuscript accordingly and would be happy to provide a new version.

Please find below the reviewer’s comments in regular italic and a point-by-point response in bold font.

Referee 1

This paper presents the results of the ISMIP6 effort to project the Greenland ice sheet sea-level rise contributions over the next century. This is a community effort which encompasses the contributions of a large number of groups around the world. As such, this paper will be an important input of the coming IPCC report. The paper is globally well written. I have nevertheless made a list of remarks which I believe might improve its clarity.

Thank you very much for the positive evaluation.

- all along the manuscript: you should refer to the TC guidelines for authors and adopt the required standards (e.g. caption are not in bold, use of Fig., Figs. and Figure, etc...)

OK. We’ve fixed the referencing of Figures. Bold font captions are defined by default in the Copernicus Word template, where mixed font entities are not foreseen. This will be handled during typesetting.

- page 2, line 20: define here (and not page 4 lines 29-30) GrIS and use it all along the manuscript afterward.

OK. Modified as suggested and replaced in the text.

- page 2, line 29: initiatives e.g. -> initiatives, e.g.

OK.

- page 3, line 10: is "in our context" necessary?

No, removed. Thanks.

- page 4, line 2 : would be nice to have already some numbers on how many models have applied here

OK, added the number of submissions.

- page 4, line 5: the bibliography should be checked as for example you are using 2020a here but not in the list of references so that 2020a and 2020b cannot be distinguished.

OK. We have checked the reference list and citations in the text and updated it to the current state. A few papers are still in discussion at this moment, so they will likely change.

- page 4, line 24: "extended" here seems to refer to something different than in the captions of Tab. 1 and Fig. 1.

Yes, there are several extensions, e.g. extending the CMIP5 range and adding CMIP6 models. We have added a reference that defines the experimental protocol.

- Table 1: the note about "open" framework should be more explicit about what it is or refer the reader to the text. In general, "extended" and "open" experiment/framework should be defined more clearly at the beginning of the paper. Also, the same notation, with or without " " should be used all along the manuscript

OK. To clarify, the distinction between ‘core’ and ‘extended’ experiments is about *which* forcing is applied, i.e. the choice of GCM and scenario. The distinction between ‘standard’ and ‘open’ refers to *how* the ocean forcing is applied as described on page 6.

In the mentioned note to Table 1 we now refer to the text, which we believe is clear about the difference between standard and open experiments. We have also removed quotas from all occurrences of ‘open’ in the text.

- page 5, line 12: Figure 1a,b -> Fig. 1a,b

OK.

- caption Fig. 1: "extended" experiments are presented whereas it is mentioned page 18 line 21 that these experiments have not been studied here. At the end, I am a bit confused with what you refer to by extended and open (see my previous remark).

As mentioned in the response to the comment above, there are several extensions defined. The text page 18 line 21 reads: "single-forcing experiments that have been proposed as part of the extended experiments". The 'as part of' is important, because the extensions consist of more than just the single-forcing experiments. Next to the core experiments. the paper only discusses additional experiments extending the CMIP5 ensemble. With the reference introduce above, we believe it is possible to understand the basics of the ISMIP6 experimental protocol.

- page 6, line 23: *exercise xhttp* -> *exercise (http (?))* isn't it a proper reference for this MIP? Also, the link is not working (error 404)

OK, link has been updated.

- page 8, line 3: *the naming for the simulation should be explained somewhere. What is the 2 referencing to?*

Ok, naming convention including the model counter has been added.

- page 8, line 7: *observed* -> *observations (?)*

OK.

- *Figure 2 (and also other figures): in general the quality of the figures could be improved. Black frames should be removed. The size of the text should be similar to the main text size. The size of the figure should be adapted to either full width or one column, depending on the figure. For Fig. 2, it should be similar to Fig. 1 in Goelzer et al. 2018 to ease comparison (with a warning on the fact that the scales are not covering the same range?).*

All black frames have now been removed and figures have been formatted to fit a column (~9 cm width) or a full page (~18 cm width). We have also adjusted text sizes in all figures where necessary.

For Fig. 2 we felt we had to update the colour map compared to Fig. 1 in Goelzer et al. 2018 to avoid similar colours for high and low values. Nevertheless , we believe the figures remain easily comparable. The different colour scale is now mentioned in the text.

- caption Fig. 4: stippled -> dotted

OK. The line style has been updated to make the contrast stronger.

- page 12, line 22: Figure S3, S4 -> Figs. S3, S4

OK

- caption Fig. 5: I don't understand what you mean here by "The diagnostic have been calculated for grid cells subsampled...". Why sampling would be important in calculating a RMSE?

As mentioned here and in the text, errors are often spatially correlated for the variables of interest. The subsampling reduces biases due to this spatial correlation. It is not critical for the results, but gives the calculated errors more credibility.

- page 13, line 9: problem in that sentence?

OK, reformulated.

- Fig. 7b: the dashed line is very difficult to see

The dashed line has been made thicker and with alternating black and grey colour to improve visibility.

- page 16, line 2: Figure 7 -> Fig. 7b

OK.

- page 18, line 10: the reduction by 1/3 is relative to what. This part is not very clear.

OK. A reduction of the relative uncertainty by 1/3 (from 29% to 20%) is found for reducing the number of GCMs from 6 to 1. We have clarified this in the text.

- page 28, line 21: if a water-pressure dependent friction law is used, some words should be said on how the basal water pressure is evaluated.

OK. The model description has been updated, clarifying that there is no dependence of basal sliding on basal temperature or water pressure.

- page 30, line 2: is it VUB-GISM ou GISM-VUB?

OK, VUB-GISM.

- page 31, line 5: minimum and maximum resolution -> minimum and maximum resolutions

OK.

Thanks again for a constructive review of our manuscript.

Referee 2 (Fuyuki SAITO)

This paper present a projection and uncertainties of the contribution of the Greenland ice sheet to sea level rise until 2100 under ISMIP6 framework. I think this paper is fairly well written with some exception (only minor) below, and can be accepted with minor revision.

Thank you for the positive review.

P4,L7 about the period 01.01.2015 — 31.12.2100. I think it not necessary to write calendar dates here. I cannot found text to mention about day or month throughout the paper, but 'end of 2014' or similar notation. I read Nowicki et al (2020a) about SMB forcing. As far as I understand, SMB anomalies for ice sheet are provided as yearly averages (although the source of SMB anomalies is provided by regional model following the calendar).

It seems useful to be specific about the exact start and end date because specifying only the year has led to much confusion.

P5,L12. about changes in SMB due to elevation changes. I suspect that the experiment ctrl_proj also includes this SMB/elevation feedback but there are no clear explanation in the text.

OK. We did not account for the SMB-height feedback in experiment ctrl_proj. This information is now added in the caption to table 1.

P6 L23 xhttp to http.

OK.

Table 2 and some figures (e.g., Fig. 5). I suggest to sort the table and figures not by contributors but by models (model column). It may help to extract common/uncommon features in the same ice-sheet model more easily (Of course a common feature may be just a coincidence).

Table 2 just lists the participants, so we believe there would be no gain in sorting it differently. In general, the results show that structural similarities between model codes have much less impact on the results than e.g. the individual initialisation strategies. This is why we expressly avoid emphasising the code base and treat all submissions as individual models.

Figure 4. It is very hard to detect in this figure which is grey dotted or which is stippled line.

The line style has been updated to make the contrast stronger.

P12. L5 and Figure 5. about log of the velocity. Not clear. log with base e of velocity in m/yr?

You are right that formally velocity has to be normalised to a unitless number before taking the logarithm. In practice, normalising with a base unit of 1 m/yr, will give the desired result. This has been added in the text.

Figure 5d. Is this plot is just an ice-sheet volume change?. If not, what is different between absolute thickness changes integrated over the model grid and volume changes?

Negative thickness changes can compensate positive thickness changes in volume calculations. Integrating the absolute thickness change gives a better idea about the model drift.

P16 L2. About NOISM. How to compute this? I assume that something like a 5km-resolution ice-sheet model (with fixed geometry) is used.

That could be one approach. We did the calculations offline and using the 1 km resolution of the forcing dataset. But the details do not matter much.

Figure 8. Is it possible to rotate the cross symbol by 45 degree (+ to x)? Some medians and means can be distinguished easily.

Yes. The figure has been updated to make it clearer. Thanks for the suggestion.

Thank you very much for the review.

Please note that due to technical corrections some model results have slightly changed and with them the overall numbers specified in the manuscript. The differences to the original submission are negligible.