

The referee's comments are included here in black font followed by our reply in blue.

Reply to Anonymous referee #1

I am pleased with the revision of the manuscript. Most of my points are clarified. I have minor comments below. Line numbers are for tracked changes file:

We are happy that we could improve the manuscript with the help of your comments and included additional changes according to your comments below.

L9: "In our simulation, the relatively cumulative ice mass loss since 1850 is equivalent to 1.4 m of sea-level rise with a cumulative ice mass loss since 1850 equivalent to 1.4 m of sea-level rise" – something went wrong here. Also, please indicate by which year the ice loss is equal to 1.4 m. I assume 2300 but two lines above you write about 2200. So please clarify here. Also, I find the terms "relatively" and "cumulative" confusing here. Why not only: "In our simulation, the ice mass loss between 1850 and XXXX is equivalent ..."?

Thanks for pointing this out. We changed the sentence following your suggestion.

L10: "These rates of ice loss show no enhancement or shift the simulated climate patterns". – This sentence does also not seem right to me. Do you mean, the ice loss is not accelerating? But it looks different in your SMB figure. Also, the term "these rates" implies that you mentioned the rates of ice loss before, which you did not.

We removed the sentence and moved the sentence about sea level higher up to improve the flow of the text.

L11: "At the regional scale, elevation changes become an important part of the Greenland surface mass balance after 2100 with around 20% of ablation happening due to elevation change in 2200". – The year 2200 seems a bit arbitrary to me. Why has this year been chosen? Also, please consider to reformulate to avoid repetition. Why not: "At the regional scale, elevation changes become an important part of the Greenland surface mass balance after 2100, accounting for around 20% of the ablation".

Just after 2100, the elevation changes are not making up for 20% of the SMB change yet - first in 2200 this contribution is as high. We adjust the sentence to "At the regional scale, elevation changes become an important part of the Greenland surface mass balance, accounting for 20% of the SMB change by 2200 and for 49% in 2300."

L12f: "By the end of the Simulation" – Better "By the year 2300"

Adjusted.

L113ff: "Ice areas that detach from the GrIS and ice loss due to calving are treated as solid discharge. CISM provides BLOM with annually collected solid discharge that is sent to the closest ocean cell as freshwater and distributed homogeneously throughout the year by BLOM". – To me "treated as solid discharge" sounds like your ocean model would include an interactive iceberg scheme. As I understand, it does not, but you add the freshwater as

liquid freshwater and withdraw the latent heat from the ocean. If so, could you clarify that the freshwater is added as “liquid freshwater” to the ocean.

Indeed, there is no iceberg scheme involved. We use the word solid discharge here, because solid discharge is calculated by CISM while liquid discharge is part of the SMB calculated by the land model CLM.

We rephrase to clarify: “Ice areas that detach from the GrIS and ice loss due to calving are sent to BLOM as annually collected discharge. BLOM transfers this directly into a homogeneously freshwater input as a salinity decrease in the closest corresponding ocean cell.”

250f: “Differences in the coupled and uncoupled simulation are visible in a more saline Davis Strait and Baffin Bay in the uncoupled run by 2100 ...” - Am I misunderstanding something? Looking at Figure A8 last row and middle column, I see a positive salinity anomaly in the Greenland Sea and maybe Denmark Strait, but Baffin Bay seems to be even a bit fresher in NorESM2 than in NorESM2fixed

Exactly. NorESM2 is fresher than NorESM2fixed - we originally wrote it the other way around “the uncoupled run is more saline”. We rephrase it to avoid confusion: “... a fresher Davis Strait and Baffin Bay in the coupled run by 2100 ”

L317f: “While in 2200, the elevation feedback contributes about 20% to the negative SMB, in 2300 SMB_{Belev} is gaining on impact and contributes almost 50% of the total SMB”.

We added “contributes” to the second half of the sentence.

Figures A1-3: Please fix the captions. They are identical, but I assume the figures show annual mean and seasonal data?

Yes, indeed. Thanks for pointing this out. We adjusted the caption and figure to show clearly that it is annual, Arctic summer and winter (JJA, DJF) air temperatures.

Figure A9: Please fix the caption, salinity at 400 m depth is not sea surface salinity.

Done.

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Reply to Anonymous referee #2

Thank you for your reviewed manuscript. I see the authors did not incorporate much of my suggestions to reduce the abundance of numbers in the text, avoid detailed visual description of figures (the reader can do that by themselves), add statistical significance (table, figures) and/or standard deviations together with (difference of) means, etc.

Thanks for your review. We added a lot more figures to the document following your first review and did not feel comfortable with statistical analysis based on two simulations. We appreciate the additional detailed requests and hope to find a good compromise by addressing those.

I have a couple of concrete requests:

- Figure with analysis of role of elevation change: I am surprised that the amount of SMB change due to climate change is much less in 2300 than 2200, can you please check?

Yes, we checked. Our approach to divide the SMB change into SMB_elev and SMB_clim is a rough approach to the problem. We acknowledge that both are affecting each other. However, computing the 2300s SMB on the 1850 ice surface and calculating the differences in SMB since 1850 does not show as much of a change as in 2200.

- Analysis of velocity changes: can you please give proof of this, e.g., add a figure?

We already added initial ice velocity and velocity changes since 1850 into Figure 8 in the first revision. Assuming that this addresses the comment in principle but that the figure is hard to find, we now added an additional reference to the figure in the text.

- The authors highlight the contribution of the elevation feedback to melt in the abstract.

Can you please add a table with the integrated SMB with/without elevation feedback?

Thank you for this suggestion. We added Table 2 into the results section showing contributions with and without elevation feedback. We also added a reference to Table 2 in the text.

- Please check grammar and spelling e.g., through dedicated software.

We have checked the manuscript thoroughly one more time.