Dear Nico,

Thanks for your comments and response. Our responses to your comments are in blue following each of yours.

Dear Ben Galton-Fenzi and co-authors,

First of all, I thank the two experts for their careful review of the initial manuscript. I also thank you for your point-by-point responses.

Both reviewers recommended to reconsider the manuscript after major revisions. Their major concerns are related to (i) the absence of analyses of temperature and salinity in front of the ice shelf cavities, and (ii) the lack of evidence for the claim that such a multi-model mean is more interesting than individual models.

On the first point, more analyses and disussions about the T,S properties in front of ice shelves is needed. Melt rates in regions with warm cavities can be adjusted by tuning the heat exchange coefficient (Jourdain et al., 2017), even though such adjustment is indeed more difficult for circum-Antarctic simulations. Regardless of the tuning, both reviewers find that the study would be much more useful if it included more assessment of temperature and salinity. Looking at the multi-model mean temperature and salinity at a given depth (or profiles averaged over a given region) would indicate whether biases are actually weak in the multi-model mean, and whether realistic melt rates are obtained for realistic conditions near the ice shelf fronts. The new table in the manuscript that will include "the average temperature and salinity on the continental shelf in the front of each of the seven ice shelves" may partly address this concern if it is enough described and discussed.

We have included averaging and the standard deviation for temperature, salinity for the cavities of the seven ice shelves and the open ocean on the continental shelf in their vicinity, included in Table 3 and linked to the discussion.

Regarding the second point, Reviewer #1 was not convinced by the interest of the multi-model mean. I consider that the use of the multi-model mean is well justified and is an interesting aspect of this manuscript. However, the provided references are related to climate models under a common forcing framework (CMIP), while the models partaking to RISE were run under very different forcings. In particular, I am not sure that averaging ocean models forced by reanalyses over the recent period together with a coupled ocean–atmosphere model in pre-industrial conditions can be expected to reduce the overall bias. I therefore expect a slightly more nuanced presentation of the added value of a multi-model mean in the revised manuscript.

We appreciate the editor’s and reviewer’s thoughtful comments on the use of the multi-model mean (MMM). We agree that unlike in coordinated modelling frameworks such as CMIP, the models participating in RISE were not all forced under identical or standardised conditions. As such, the ensemble models reflect not only structural differences in model physics and numerics, but also variations in boundary forcing and resolution. We acknowledge that this heterogeneity limits the strict applicability of ensemble theory in its classical statistical sense - particularly the assumption that model errors are independent and identically distributed. Therefore, while the ‘central limit theorem’ provides a conceptual basis for understanding ensemble averaging, its assumptions are only partially met in the RISE ensemble. Nonetheless, we argue that the MMM retains utility as a descriptive metric that synthesises diverse model behaviour, especially when interpreted with appropriate caution. In this context, the MMM does not necessarily represent an optimal or unbiased estimate of the true melt rate but provides a ‘first-order synthesis’ of model diversity. It can help identify robust spatial patterns and highlight areas of persistent inter-model disagreement. As advised, we have updated the manuscript under the Assumptions and Limitations section in the discussion,

to reflect this more nuanced interpretation and explicitly discuss the caveats associated with averaging models forced under different conditions.

In the revised version, please also provide an explicit link to the data and code shared through the AAD data center.

This is not available to us at this time as the data are embargoed until publication proceeds but we can provide the explicit link once it has been provided to us.

Regards, Ben Galton-Fenzi on behalf of co-authors.