We thank the Editor Claudia Timmreck and the three reviewers for their careful evaluation of our manuscript. We found the comments very useful and think that our manuscript will be greatly improved thanks to them. To ensure clarity, the reviewer's comments are written in black and our responses in light blue.

Reviewer #1

General comments:

The submitted manuscript investigates the impact of internal climate (oceanic and atmospheric) variability in projections of Antarctica's sea-level contribution until year 2100. For this purpose the authors run standalone ice-sheet simulations applying output from a selection out of ensemble simulations of three CMIP6 climate models. Besides quantifying the relevance of the internal climate variability for sea-level projections, the authors also give recommendations for future ice-sheet projections. I deem the study a valuable contribution to the Earth System modeling community, especially the ice-sheet modeling community. I find the manuscript clearly written, well structured and mostly understandible. The figures illustrate the findings well. The methodology seems consistent and the conclusions plausible. I would like to mention that my assessment is limited regarding some oceanic mechanisms described in the study (which I refer to in my specific comments) and details of the applied metrics in Sect. 4.3. They seem plausible but I didn't have the time to dig deeper into the details.

I would support the publication of the manuscripts after my few points below have been addressed.

Specific comments:

The last sentence of the abstract seems a bit detached from the rest of the abstract. Maybe a different introduction of the sentence would help for a smoother reading.

Indeed, the transition to the last sentence is a bit abrupt. We will replace « *We then issue recommendations for future ice-sheet projections: use several members... »* with *« Based on these results, we recommend that ice sheet model projections consider several... »*

L28: Is there a typo: "of" instead of "on"?

Yes, the manuscript will be corrected accordingly.

L50: Why SPP2-4.5?

We will clarify the choice of scenario in §2.3 rather than at the end of the introduction as follows *« We use the medium SSP2-4.5 scenario, which corresponds to a global warming of 1.4 to 3.0°C from 1995-2014 to 2081-2100 (90% confidence interval, Lee et al. 2021) and seems the most representative of current effort to tackle climate change (Riahi et al., 2017). As the choice of greenhouse gas emission scenario has only a limited impact on the projected Antarctic contribution to sea level rise until 2100 (Seroussi et al., 2020), we have not repeated our calculations for other scenarios. »*

L56: drivers

Yes, the manuscript will be corrected accordingly.

L82: Which friction law is it? I don't see the necessity to write the law down here but a reference to the equation would be helpful.

Since this comment appeared several times, we will add the law in the main text for clarity as follows *« The ice dynamics is computed by solving the Shallow Shelf Approximation (SSA) of the Stokes equations (MacAyeal, 1989), assuming an isotropic rheology following Glen's flow law (Glen, 1955) and a linear friction law (i.e., $\tau_b = C\, u_b$ where τ_b is the basal shear stress, C the friction coefficient and u_b the basal ice velocity). »*

L120: What's the sense of these abbreviations?

If we are correct, you are referring to the abbreviations on lines L121-122 for the names of CMIP6 experiments rXiXpXfX. These abbreviations are a CMIP convention and are a brief description of the experiment. rX corresponds to realization index (i.e., the member number), iX to initialisation index, pX to physics index and fX to the forcing index.

We will add, in the main text, a link to a URL (https://goo.gl/v1drZl) that describes the CMIP6 writing conventions for the attributes.

L164-166: I am not able to follow the causal chain. Which location do the authors mean by "there" at the end of the sentence (I guess the Eastern Ross Sea)? I am not an expert on such oceanic mechanisms/patterns and personally would be glad to get a clearer explaination.

We will replace *« As described by Mathiot and Jourdain (2023) and Siahaan et al. (2022), lower rates of HSSW formation in the eastern Ross Sea can favor the intrusion of Circumpolar Deep Water (CDW) in the western part, which may explain why mid-depth temperature variability is highest there (Fig. 3e) »* with *« The deepest part of the Ross Sea is occupied by the densest water mass, so that there is a competition between intrusions of relatively warm and salty Circumpolar Deep Water (CDW) advected from offshore and the production of cold dense water (HSSW) through sea ice formation and associated convection (Mathiot and Jourdain, 2023 ; Siahaan et al. 2022). The variation between the occupation of these two water masses may explain the high mid-depth temperature variability in the Ross Sea (Fig. 3e). »*

L179: Again, as a non-specialist regarding the ocean: What does it mean when you state "Both IPSL-CM6A-LR and UKESM1-0-LL seem to be prone to convection"?

We will replace the current sentence with *« The weaker stratification of IPSL-CM6A-LR and UKESM1-0-LL than in MPI-ESM1.2-HR indicates the presence of more convective mixing, as convection mixes cold and salty water produced by sea ice formation with warmer water at depth. »*

L224-225: "On average, the amplitude of SLC variability relative to the atmosphere is 3.4 times higher than that relative to the ocean." This sentence is not entirely clear to me and I would

appreciate if the authors could briefly explain what is exactly meant. How is this finding deduced? Is it shown in a figure which could be referenced here?

For each of the three CMIP6 models, we compare the amplitude of sea-level contribution (SLC) variability induced by ice flow dynamics, which is largely modulated by ocean-induced basal melting (Figure 6b), with the amplitude of the SLC variability due to the surface mass balance (Figure 6c), which is largely driven by the atmosphere. When we talk about amplitude, we mean the difference between the SLC value in 2100 of the member giving the smallest contribution and the member giving the largest contribution.

We will add a reference to Figure 6 in the main text for a clearer explanation as follows *« On average, by the end of the century, the amplitude of SLC variability due to the atmosphere (Fig.6c) is 3.4 times higher than the variability due to the ocean (Fig.6b). »*

L258-259: How is this finding deduced? If I am right it can be seen from Fig.6a?

You are entirely right, this statement is directly based on Figure 6a. We compared the amplitude due to internal variability (i.e., amplitude of the difference between the SLC value in 2100 of the member giving the smallest contribution and the member giving the largest contribution) with the amplitude related to the choice of climate model (i.e., amplitude of the difference between the multi-member mean SLC value in 2100 of the climate model giving the smallest contribution and the climate giving the largest contribution).

We suggest to replace « *Our simulations, involving three climate models, suggest that the choice of climate model and internal climate variability both have a similar impact on Antarctic SLC, although there are disparities on a finer scale* » with *« The comparison of the amplitude of SLC in 2100 due to internal variability (shaded area in Figure 6a) with the one due to the choice of climate model (difference between extreme thick lines in Fig. 6a) shows that the choice of climate model and internal climate variability both have a similar impact on Antarctic SLC. »*