Review of van der Linden et al. " Antarctic dynamics contribution to future sea level constrained by ice discharge observations".

General Comments:

In this paper, the authors use linear response functions of 16 ice sheet models from LARMIP-2 to estimate contributions to sea level under three different SSP future emissions scenarios. Forcing is derived from ocean conditions in 14 CMIP6 models. Different methods tested include trying different depths for ocean thermal forcing, two types of parameterizations (linear, quadratic), and differing regions for basal melt sensitivity calibrations. Instead of calibrated to observed melt rates as in other studies to date, van der Linden and others calibrate to four decades of observed ice discharge (Rignot et al., 2019). This is done for an Amundsen-specific calibration as well as an Antarctic-wide calibration.

I thank the authors for their work to implement comments from the previous round of reviews. I think it is clear there has been a lot of effort in these revisions, and I think the new methodology takes care of the major notes raised in the first round. The authors have now taken care of the issue of what happens when calibrating to a region that has seen very little mass loss in the historical period.

In general, I think the paper reads well now. My main comment is that, as the title states, the paper aims to deliver Antarctic sea level estimates based on a new methodology. However, the way it reads now, the actual SLR values are not woven through the text (the results exist in figures and tables only). I recommend that the Abstract, Results, and Conclusion sections all explicitly state the actual resulting values. This will improve readability as well since, at the moment, it is easy to get lost in all the methods and which ones lead to higher or lower SLR estimates. An example of this might be in lines 365-368, where the authors discuss the contributions they arrive at as compared to other studies (LARMIP and ISMIP6).

Another related issue is the Conclusion section. Plenty of this section is repeated information from the Discussion. I think it would be helpful to spend more time in the Conclusion putting the authors' results in context of other SLR estimates, and again, explicitly stating their new SLR estimates.

Please see below for some other comments that will improve clarity for the reader.

Comments:

Section 2 (Methodology). I think you could use a very brief explanation of the steps in Figure 1 to walk through the steps so the reader knows what to expect in terms of flow before you launch into the details of each step in each subsection that follows.

L105: Why do you choose the depth level 800-1000m in addition to the ice shelf base depth? Is there some rationale to choosing that depth? I know you're trying to see if the depth matters,

but is there a good reason to choose this one? Later on, near line 402, you do mention that this is because this is where relevant water masses that drive melting closer to the grounding line originate, but I'm not sure I exactly follow. At the least a reference is needed here.

Section 2.3
It seems to me that the calibration methods should come before the Sea level contribution method. Because 2.2 ends with talking about calibration, then you start into a very short sea level equation, and the back to the calibration. Consider re-organizing some of this for better flow that matches your actual methodological order.

Minor Comments:

Title. Suggesting: "Antarctic contribution to future sea level as constrained by ice discharge observations"

L36-37: commas: To address this issue, our study aims to gain more insight in the Antarctic contribution to, and uncertainties in, future sea level …

L66: …over ocean temperature changes as a driver is that uncertainties in GSAT…

L69: …this step by using subsurface ocean temperature as the driver ….

L78-79: thereby constraining the basal melt even before the observational period. I think I know what you mean here, but it could be rephrased for clarity.

L79: As a calibration target, ….

L80 & 82: State the year for the Rignot paper explicitly when citing in-line.

L126: Again, I wouldn't say ESM's typically do not represent ice cavities, if none actually do.

L130 and throughout: italicize *in situ*

L148: CMIP6 ESMs do not resolve cavities, as far as I know. Clarify that by removing 'typically'

L188: Do you mean to say the basal melt is computed from subsurface TF anomaly? Also, please state explicitly in this sentence that this is coming from CMIP models.

L208: For the linear parameterizations, we compared our calibrated basal melt sensitivities to the values used in LARMIP-2.

L212-217: Please explain more explicitly why the underestimation/overestimation occurs. I'm not sure the reason is immediately clear.

L218-219: A similar comparison was made for the quadratic paramterization, with the basal melt sensitivities applied in ISMIP6 (Jourdain et al, 2020). Here, the median Antarctic-wide calibrated…

L230: Dataset is one word

L240: "Furthermore, the spread in our calibrated melt sensitivities…"

L243-246: "Models with calibrated melt sensitivity values outside the observation-based ranges would either underestimate or overestimate the past ice discharge if observation-based sensitivities had been applied. As a result, the spread in simulated ice discharge over the historical period will be lower for calibrated basal melt sensitivities than for the observation-based basal melt sensitivities." I'm not sure the second sentence obviously follows the second. I actually think these sentences are just generally hard to follow, and could use some re-writing to improve clarity.

L280: … with respect to the total Antarctic contribution cannot be reproduced either (about 70%...)

L287: performs better in the other region -- which region??

L292: Nevertheless, the mean response….

L315: Perhaps indicate that these results are shown in Figure 8 somewhere here.

L322: There is a discussion of ratios that are higher and lower depending on the method, but please state what the values of these ratios are.

L325: What do you mean by highest basal melt method? Please clarify.

L331: Discussion of large spread in the projections, but please put a value to this.

Table 8: I like this table, and the comparison you draw with ISMIP6 and LARMIP2. I am wondering why you picked 17% and 83% instead of 5 and 95% (I assume these are percentiles, but you may want to make this explicit in the caption). I also wonder if there is a way of visualizing these results in a figure? At the moment there are plenty of figures showing comparisons of different methods, but it would be nice if there were a figure showing all the final SLR projections as compared to other leading estimates in the literature.

L403: … grounding line originate from ….

Figure 7: Could increase size of this figure.

Figure 8 & 9: Please make all 6 panels the same size, and place legend either below or to the right of these six panels. X-axis label on bottom row is missing. Please also indicate more clearly that the blue and orange indicate the main methods used and that pink and yellow indicate the additional test with the single basal melt sensitivity it applied. Also, I think at least in my version, the red line showing the median is difficult to see, particularly in the red and orange distributions. Consider a different color?

L479: …, related to ice sheet instabilities and ocean dynamics, are not considered…

L489: remove (fully)

L502: A physical explanation for a mismatch…. A mismatch in what? Please be specific.

L508: …during the calibration period is representative of the future.

L526: What do you mean it is dominated by ice dynamics? This seems vague.

L545: …uses global mean temperature as the driver…

Consider making Fig 12 & 13 two panels in the same figure since they share the same structure, design, and legend.

Make Figure A1 and A2 the same sizes and ratios. A2 looks more stretched than A1.

L574: remove ‘ dynamics’

Conclusions section: Much of this is a repeat from the Discussion. Please consider editing the conclusions to include just the biggest take home messages and spend more time putting that in the context of the bigger picture of sea level projections, modeling Antarctic mass loss, and potential avenues and recommendations for future work.