

We would like to thank the editor for his helpful comments, which have improved the clarity of our paper. Please find below our responses in blue and the changes we made in green below the comments.

### Major comments

I would like to thank the reviewers and the community members for providing thoughtful and constructive comments. The authors have done a lot of work to address these comments in the revised manuscript and I think that this has improved the paper. However, some significant concerns were raised about the treatment of uncertainty and the potential for large systematic errors in the aggregated mass balance results, and your response to reviewers does not appear to sufficiently address these concerns. Before this paper can proceed to final publication several points need to be addressed.

First, the methods section is quite brief and does not fully and clearly describe the procedures used. This should be expanded and the treatment of uncertainty, strengths and limitations, and rationale for the approach should be directly addressed here rather than left for later in the discussion. Also, other parts of the paper are quite detailed in describing and interpreting the results and begin to go beyond the scope of ESSD. Specifically, “Articles in the data section may pertain to the planning, instrumentation, and execution of experiments or collection of data. Any interpretation of data is outside the scope of regular articles. Articles on methods describe nontrivial statistical and other methods employed (e.g. to filter, normalize, or convert raw data to primary published data) as well as nontrivial instrumentation or operational methods. Any comparison to other methods is beyond the scope of regular articles.” By expanding the methods description and cutting some of the discussion, this would better address reviewer concerns, focus the paper more directly on how the aggregated data product was derived, and put the treatment of uncertainty upfront.

- In our revised manuscript we have explained our treatment of uncertainty in more detail, and we have assessed the potential for systematic errors associated with mass changes from peripheral glaciers and ice caps. Our method section (Section 3) is now expanded to contain a more detailed description of our estimated errors at each step. Peripheral ice masses have a small (<5 %) impact on our mass balance assessment because their signal is only a potential omission in gravimetry-based estimates (i.e. one third of our reconciled estimate), and because the mass change owing to glaciers and ice caps is in any case small relative to the mass change of the ice sheets. The potential bias is within the uncertainty bounds of our reconciled estimate. While our participants make efforts to account for the mass loss, it remains challenging to do so for those based on satellite gravimetry, and this remains an area of future research.
- We have removed the comparison of the results to projected sea level rise and associated figure and table.

### Specific Comments

**Figure 1:** The caption says that uncertainty is calculated as the RMSE at each monthly epoch while the shading represents the standard deviation of the aggregated time series. It isn't clear what the measure of uncertainty is to me. In Figure 4 the uncertainty is quantified as the standard deviation. Or is sigma not standard deviation? Later in the text it is defined as that (P16, L326). This should be

better explained in the text and captions so that it is more clear what is shown. This was also raised in CC1.19, but the action taken didn't quite clear this up in the paper.

**Response:** We agree that the caption is not very clear. Here (and on Figure 4 as well), sigma is not the standard deviation but the measure of our uncertainty. On Figure 1, the uncertainty plotted is the uncertainty of our aggregated time-series per satellite technique as calculated in step (ii) of our methods, which is calculated as sum in quadrature of the contributing individual time-series errors divided by the square root of the number of estimates. We have clarified our uncertainty calculation in the text, detailing the calculation at each step and have clarified the caption of Figure 1. We also removed from Figure 1 the different grey shadings and kept only the darkest grey shading representing the uncertainty to improve the clarity of the figure.

**Actions:**

- We have clarified the caption of Figure 1 as:

Individual rates of ice sheet mass balance from the input-output, altimetry, and gravimetry groups over the GrIS, APIS, EAIS, and WAIS included in this study and standardised following the procedure described in Section 3 (i). The grey shading shows the estimated uncertainty of the aggregated time-series per group calculated following the procedure described in Section 3 (ii).

- We removed the different grey shadings and kept only the shading representing the uncertainty of the aggregated group estimate.

In regards to **CC1.5**, it might be useful to add a sub-heading under data called background for the first paragraph.

**Action:** We added this sub-heading.

In regards to **CC1.8**, the link you provided in your response could be added to the text of the manuscript.

**Action:** We added the link to the drainage basins description in the text (section 2.2 Input data).

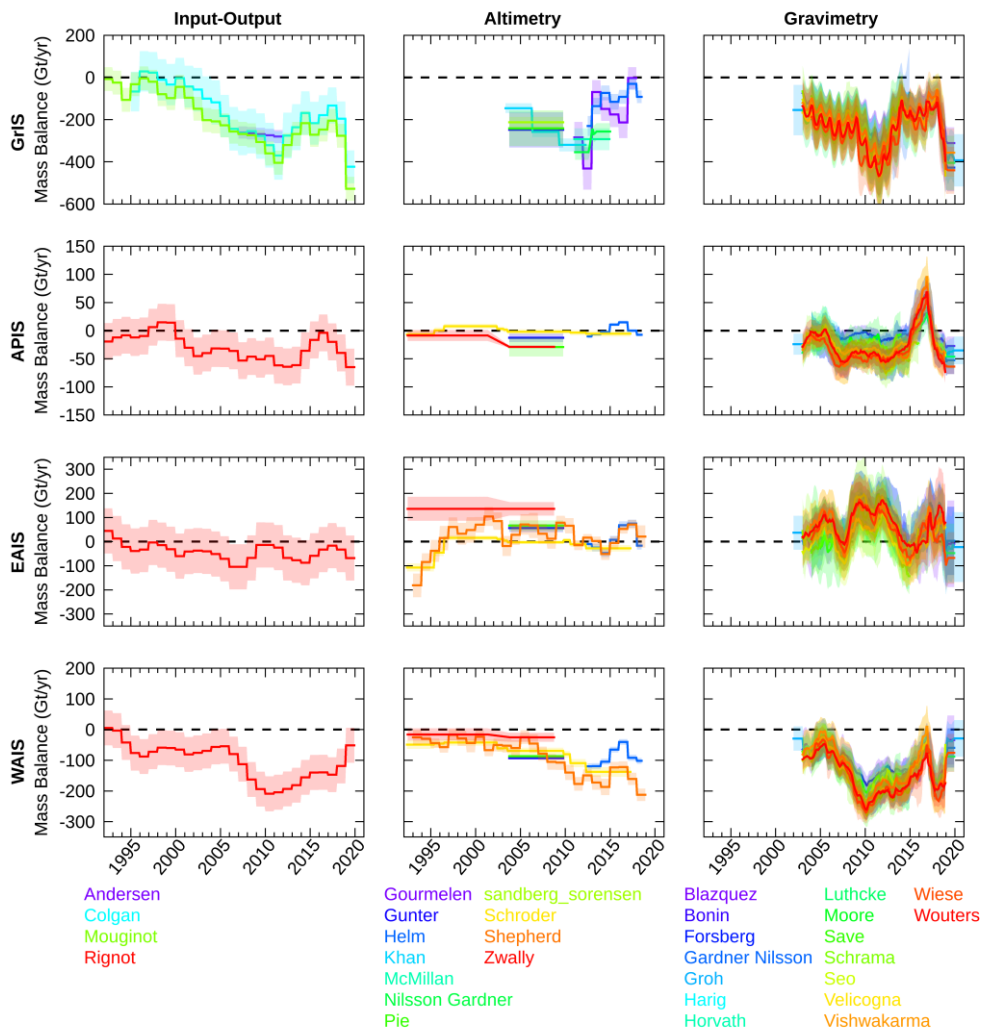
**Section 3 (Methods):** This is a fundamental section of the paper and is essential for understanding this data product and its quality. The error analyses should be better defined, clearly described, and some rationale or justification should be provided.

**Response:** We have revised this section and added details in each sub-section on our error calculation and added a new paragraph describing how we account for the inclusion of the peripheral glaciers and ice caps in our error budget. Below we detail the changes made in each sub-section.

**3 i) Computing time-series of mass trends:** Is the output of this step what we see in Figure 1? There is some error computed for each series—is this shown anywhere? Is the uncertainty (sigma) that is shown in Figure 1 an output from step ii? I am not clear how the error incorporates the original measurement error.

**Response:** Figure 1 shows the  $dM(t)/dt$  time-series derived from step (i), but the errors plotted on top are not the individual error time-series but the aggregated errors calculated from step (ii). This choice stems from the fact that if we were to plot the individual error time-series calculated from step (i),

there would be too many overlapping shading, especially for the gravimetry group, and the figure would not be easy to read. We plotted the figure with individual errors for reference below:



Regarding the uncertainty calculation for step (i): at each epoch, the error on the derived  $dM(t)/dt$  is computed as the sum in quadrature of the standard error of the linear regression and the mean of the input errors falling with the 36-month sliding window. This second term thus incorporates the original measurement error.

#### Actions:

- We have clarified the caption of Figure 1 (see also our response to your previous comment on Figure 1)
- We have revised the text describing the error calculation of step (i) as:

‘The error on the derived time-series is taken as the sum in quadrature of the linear model structural error computed as the standard error of the linear regression  $s_e$  and the mean of the errors of the  $n_w$  points in the original  $\Delta M(t)$  time-series falling within the 36-month sliding window as:

$$\sigma_{\frac{dM}{dt}}(t) = \sqrt{s_e^2 + \left( \frac{1}{n_w} \sum_{i=0}^{n_w-1} \sigma_{\Delta M,i} \right)^2} \quad (1)$$

**3 ii)** Aggregating time-series of mass trends from similar satellite observations: This section could be expanded and made more clear. Please explain how the error-weighted averages were computed. It says that this was done using the same approach—as in step i)? That was a linear trend fitting approach as I understand. Then the overall error of aggregate series is RMSE of contributing time series. Is this the uncertainty we see in Figure A1?

**Response:** This is a misunderstanding from our text not being clear enough. The original sentence was: ‘We calculate each aggregated time-series by taking the error-weighted average of monthly rates of ice sheet mass change computed using the same technique’. Here, ‘the same technique’ referred to the altimetry, gravimetry, or input-output method, and was not meant to be read as ‘the same approach as step (i)’. We removed this to improve the clarity of the section and detailed further our uncertainty calculation. The uncertainty calculated in step (ii) is the uncertainty shown in Figure A1 (and in Figure 1). We clarified further our description of the errors calculation: we define the errors on the aggregated time-series as the sum in quadrature of the errors of the contributing individual estimates divided by the square root of the number of estimates used in the aggregated product, rather than describing it as the root-mean-square of errors, which could be mistaken as the RMSE.

**Actions:**

- We corrected the corresponding text and added the equations used for deriving the aggregated time-series for each satellite technique and the corresponding error:

We aggregate the standardised time-series of mass trends within the altimetry, gravimetry, and input-output groups separately to produce three time-series over each ice sheet region  $\left. \frac{dM_{aggr}(t)}{dt} \right|_{group}$ , where *group* refers to one of the three independent satellite techniques (i.e. altimetry, gravimetry, or input-output method). We calculate each aggregated time-series by taking the error-weighted average of the  $n_{estimates\ per\ group}$  individual monthly rates of ice sheet mass change available from the same satellite technique group at each month:

$$\left. \frac{dM_{aggr}(t)}{dt} \right|_{group} = \frac{\sum_{i=0}^{n_{estimates\ per\ group}-1} \left. \frac{dM(t)}{dt} \right|_{group,i} / \sigma_{\left. \frac{dM(t)}{dt} \right|_{group,i}}}{\sum_{i=0}^{n_{estimates\ per\ group}-1} 1 / \sigma_{\left. \frac{dM(t)}{dt} \right|_{group,i}}} \quad (2)$$

The associated error is calculated as the sum in quadrature of the contributing individual time-series errors belonging to the same group divided by the square root of the number of estimates in the group:

$$\sigma_{aggr,group}(t) = \sqrt{\frac{1}{n_{estimates\ per\ group}} \sum_{i=0}^{n_{estimates\ per\ group}-1} \sigma_{\left. \frac{dM(t)}{dt} \right|_{group,i}}^2} \quad (3)$$

- We changed the caption of Figure A1 to:

Mass balance time-series from the aggregated altimetry, gravimetry and input-output method over the a) WAIS, b) EAIS, c) APIS, and d) GrIS. The vertical dashed lines mark the overlap period of the three time-series. The aggregated time-series and corresponding uncertainties are calculated following the methods described in Section 3 (ii).

**3 iii)** Combining the altimetry, gravimetry, and input-output time-series of mass trends: Here again it is unclear how the error-weighted mean was calculated. Then error of the reconciled mass series is estimated as RMSE divided by number of techniques. What is the rationale or justification for this? Or this arbitrary? Then rate of annual mass balance and that over certain epochs is calculated and error is the average of contributing error divided by square root of the number of years of the time period. Specifically, why? It isn't clear and by this point it is difficult to track how errors have been accumulating (or been neglected) throughout the process. Finally the mass trends are summed over multiple ice sheets and the error is the root sum square of uncertainties for each region. What about the concerns raised by the reviewers about peripheral ice masses and their change?

**Response:** We feel it is important to stress that the methods we employ are well established in the literature (see e.g. Rignot et al. (2019), IPCC AR5 (Vaughan et al., 2013) and AR6 (Fox-Kemper et al., 2021), and previous IMBIE assessments (Shepherd et al., 2012; The IMBIE Team, 2018, 2020)). Furthermore, because we can only make significant changes to our core methods by completing a formal consultation with our project participants which we accommodate in annual cycles, we cannot change significantly the methods we employ to compute uncertainties. However, we have clarified our uncertainty calculation and we now discuss the impact of the peripheral ice masses in our assessment.

We have added the formula used to calculate the error-weighted mean and we have clarified the description of our error calculation on the reconciled altimetry, gravimetry, and input-output mass trends time-series: we compute the error on the reconciled mass trend time-series at each epoch as the sum in quadrature of the aggregated time-series errors divided by the square root of the number of independent estimates available. We added the equation in each sub-section of Section 3, which hopefully improves the clarity of our error characterisation and makes it easier to track how errors have been propagated throughout.

Regarding the peripheral ice masses and their change, we added a new paragraph at the end of Section 3 to discuss the impact of their inclusion in gravimetry estimates. We use the estimate from Hugonnet et al. (2021) to remove the contribution of the peripheral glaciers and ice caps on our aggregated gravimetry time-series and re-combine this modified gravimetry time-series with the altimetry and input-output aggregated time-series. We find that removing the peripheral ice masses has a small impact on our final reconciled mass balance estimates with a reduction in the rate of mass loss of less than 10 Gt yr<sup>-1</sup> in Greenland and less than 3 Gt yr<sup>-1</sup> in Antarctica, which is smaller than our uncertainty estimate.

**Actions:**

- We clarified our error calculation for the reconciled mass trends time-series:

We combine the altimetry, gravimetry, and input-output time-series to produce a single reconciled time-series of mass trends by taking the error-weighted mean of the  $n_{group}$  independent estimates for which a mass trend estimate is available at each epoch (comprised between 1 and 3):

$$\frac{dM_{reconciled}(t)}{dt} = \frac{\sum_{i=0}^{n_{group}-1} \frac{dM_{aggr,i}(t)}{dt} / \sigma_{aggr,i}(t)}{\sum_{i=0}^{n_{group}-1} 1 / \sigma_{aggr,i}(t)} \quad (4)$$

We estimate the error on the reconciled mass trend time-series at each epoch as the sum in quadrature of the aggregated time-series errors divided by the square root of the number of independent estimates available:

$$\sigma_{reconciled}(t) = \sqrt{\frac{1}{n_{group}} \sum_{i=0}^{n_{group}-1} \sigma_{aggr,i}^2(t)} \quad (5)$$

Finally, when summing mass trends of multiple ice sheets, the combined uncertainty is estimated as the root sum square of the uncertainties for each region:

$$\sigma_{total}(t) = \sqrt{\sum_{regions} \sigma_{reconciled,i}^2(t)} \quad (6)$$

- We added a new paragraph in Section 3 in which we discuss the inclusion of the peripheral glaciers and ice caps and its impact on our reconciled assessment:

Here, we discuss the potential systematic bias introduced by the inclusion of the peripheral glaciers and ice caps (GICs) in the gravimetry estimates included in our assessment as the spatial resolution of satellite gravimetry is not sufficient to resolve separately the mass change signals of these two neighbouring ice masses. To examine this further, we use Hugonnet et al. (2021) dataset (<https://doi.org/10.6096/13>, last access: 23 February 2023), which provides mass balance estimates of the glaciers located at the periphery of the ice sheets derived from high resolution digital elevation models. During the overlap of Hugonnet et al. study and the gravimetry recorded employed in this study (2002-2019), Greenland peripheral glaciers lost mass at a rate of  $35.5 \pm 1.6 \text{ Gt yr}^{-1}$ . In Antarctica (excluding the Sub Antarctic glaciers located further than 1000 km from the ice sheet), peripheral glaciers lost mass at a rate of  $11.8 \pm 3.4 \text{ Gt yr}^{-1}$ ,  $0.7 \pm 1.1 \text{ Gt yr}^{-1}$ , and  $5.7 \pm 2.5 \text{ Gt yr}^{-1}$  at the APIS, EAIS, and WAIS, respectively. To test the impact of the inclusion of the peripheral glaciers in our gravimetry estimates on our reconciled ice sheet mass balance assessment, we use the peripheral glaciers mass trends time-series from Hugonnet et al. to remove the contribution of the GICs on our aggregated gravimetry time-series. We use consecutive 5-year rates of mass change for this analysis and their corresponding uncertainties. For 2020, which is not covered by Hugonnet et al., we use the rate of mass change estimated over the 5-year period 2015-2019 instead. We combine in quadrature the uncertainty on the peripheral GICs mass balance and the uncertainty of our aggregated gravimetry mass balance calculated from Eq. 3. Next, we follow the procedure described in step (iii) to re-combine this modified gravimetry aggregated time-series with the altimetry and input-output aggregated time-series. We compare this modified reconciled estimate to our original estimate and find that removing the contribution of the GICs from the gravimetry time-series results in a reduction in mass loss of 4.1 % and 3.3 % in Greenland and Antarctica, respectively, smaller than the uncertainty bounds of our reconciled estimate (Table A2). This simple analysis shows that the inclusion of the peripheral ice masses in the gravimetry estimates included in this study has a negligible impact on our reconciled mass balance assessment of the WAIS and EAIS, and only a small impact (less than  $10 \text{ Gt yr}^{-1}$ ) on our assessment of the GrIS and APIS.

- The rates of mass change computed from both our original reconciled estimate and this modified estimate are presented in a new supplementary table (Table A2):

**Table A2. Rates of mass change (in  $\text{Gt yr}^{-1}$ ) over the gravimetry record (2002 to 2020) from our reconciled estimate and from a modified version of our reconciled estimate in which the contribution of the peripheral glaciers has been removed from the gravimetry estimates following the method described in Section 3.**

	Reconciled assessment	Modified reconciled assessment
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<b>GrIS</b>	-235.6 ± 20.6	-226.0 ± 20.6
<b>APIS</b>	-18.3 ± 6.0	-15.7 ± 5.8
<b>EAIS</b>	6.1 ± 19.7	6.2 ± 19.6
<b>WAIS</b>	-104.8 ± 11.2	-103.6 ± 10.8
<b>AIS</b>	-117.0 ± 23.5	-113.1 ± 23.2

- We modified the first paragraph of our roadmap to further discuss this:

These glaciers therefore need to be accounted for without ambiguity in future IMBIE assessments to remove systematic biases between the different satellite techniques linked to their (non-)inclusion in individual mass balance estimates. Here, we performed a simple analysis to assess the potential impact of the ambiguous inclusion of these peripheral ice masses in our reconciled mass balance assessment and showed that this impact is limited thanks to the fact that we are aggregating different satellite techniques together – including some able to resolve separately ice sheet mass changes – and a different weighting has been applied to the different estimates included. However, future approaches to address this issue will require careful treatment of the leakage of mass signals between the ice sheets and their peripheral GICs within the gravimetry community, rather than being limited to a subsequent removal of the contribution of these glaciers as we have done here. This will nonetheless require robust mass balance estimates for developing and evaluating new methods. The recent inventory of Earth’s glaciers from satellite photogrammetry (Hugonnet et al., 2021), recent progress in satellite altimetry – with the development of CryoSat-2 swath radar altimetry for measuring mass changes of mountain glaciers (Foresta et al., 2016; Jakob et al., 2021) and the launch of ICESat-2 –, and new community initiatives, such as GlamBIE (the Glacier mass balance Inter-comparison Exercise), will further contribute to this effort.

**3 iv)** Generating the final reconciled time-series of cumulative mass change: The time series are integrated and cumulative error is root sum square of annual errors, assuming errors are not correlated over time. Errors quoted in the text refer to the one sigma error. I do not understand this, is sigma not the standard deviation? What if errors are correlated over time? What about the large potential systematic error of including peripheral ice masses? These were major concerns by the reviewers.

**Response:** Here sigma refers to the uncertainty estimate and not to the standard deviation. We agree that this is confusing and have removed the sentence ‘Errors quoted in the text refer to the one sigma error’ and now only show the 1-uncertainty range on Figure 1 and 2 instead of the 1-, 2-, 3-sigma ranges.

We have addressed the systematic error of including the peripheral ice masses in our estimate at the end of Section 3 and have detailed this in our previous comment.

**Actions:**

- We further detailed our error calculation as:

We generate a time-series of cumulative ice sheet mass change by integrating our reconciled time-series of mass trends over time for each region. We estimate the cumulative errors as the root sum square of errors, divided by 12 as our estimates are posted at monthly epochs:

$$\sigma_{cumul}(t) = \sqrt{\frac{1}{12} \sum_{i=0}^{t-1} \sigma_{reconciled}^2(i)} \quad (7)$$

- We modified Figures 1 and 2 to show only the uncertainty range (and removed the 2-, 3-uncertainty ranges).

**P 15, L 304:** Why is Figure 3 discussed before Figure 2? Should Figure 2 not be mentioned and pointed out earlier in the section?

**Action:** We added a mention to Figure 2 earlier in Section 4.

**Figure 3:** What do the bars represent? What is this range? It is not the max and min values as shown in Fig A1, nor does it appear to be the standard deviation. The text says “We report the standard deviation of the aggregated-altimetry, gravimetry and input-output estimates rates of mass change and compare it to the reconciled rate of mass change and its uncertainty (computed as described in Section 3).” Please clarify this.

**Response:** The pink, green, and blue vertical coloured bars represent the rates of mass change over the overlapping period of the three techniques derived from the aggregated time-series of altimetry, gravimetry, and the input-output method, respectively, as calculated from Section 3 step (ii). Their range is their mass balance rates +/- uncertainty. The grey box represents the reconciled estimate calculated from combining these aggregated group estimates following Section 3 step (iii). The horizontal grey bar in the middle of the grey box is the reconciled rate of mass change and the height of the grey box is the uncertainty on the reconciled rate of mass change, calculated from step (iii).

In the text, we contrast the standard deviation in aggregated rates of mass balance over the overlap period of the three techniques (altimetry, gravimetry, input-output over their common periods) to the uncertainty of their reconciled estimate (which is the combination of those three aggregated time-series) over the same periods.

**Actions:**

- We clarified the caption of Figure 3 as:

Inter-comparison of rates of ice sheet mass balance of (a) the AIS, WAIS, EAIS, and APIS over the overlap period 2002-2019 and of (b) the GrIS during the overlap period 2003-2018 derived from the altimetry, gravimetry, and input-output techniques. The coloured bars represent the rates of mass balance and uncertainties of the aggregated technique time-series as calculated in Section 3 step (ii). The grey box represents the rate of mass balance of our final reconciled assessment calculated following the procedure detailed in Section 3 step (iii). The horizontal line in the middle of the box shows the reconciled rate of mass balance and the height of the box represents its associated uncertainty.

- We clarified the corresponding text as:

We compare the standard deviation in aggregated rates of mass change altimetry, gravimetry and input-output estimates rates of mass change and to the uncertainty of our reconciled mass balance estimate (computed from Eq. 5) to assess whether differences between techniques are significant compared to the uncertainty of our reconciled assessment.



**P16, L 320:** It appears the Greenland series show the strongest temporal correlation. There are times when the temporal trends are in opposite direction for WAIS. And is this with reference to Fig A1? Then on line 323 it says the altimetry series is poorly correlated with the other series for GrIS. Judging from Fig A1 this is incorrect. Is this a mistake? Am I missing something?

**Response:** Thank you for spotting this mistake. Yes, the three time-series are well correlated at the GrIS. Here are the correlation coefficients for each ice sheet:

	$R^2$ (ALT/IOM)	$R^2$ (ALT/GMB)	$R^2$ (GMB/IOM)
GrIS	0.66	0.79	0.83
APIS	0.11	0.18	0.83
WAIS	0.36	0.52	0.83
EAIS	0.02	0.05	0.32

**Action:** We have corrected the text accordingly:

When examining the aggregated time-series of rate of mass change at annual resolution, we find the highest temporal correlation between the three time-series at the GrIS ( $0.66 < r^2 < 0.83$ ). In addition, the gravimetry and input-output annual rates are also well-correlated at the APIS and WAIS ( $r^2 = 0.83$ ). However, the altimetry mass balance time-series is poorly correlated with both the aggregated gravimetry and input-output time-series at the APIS and EAIS ( $r^2 < 0.18$ ).

**P16, L 325-327:** It says that almost all annual mb estimates fall with one standard deviation of the reconciled estimate. Is this by method (altimetry, IO, gravimetry)? Or overall? It seems there is far more variation among individual mass balance estimates than that.

**Response:** We made a mistake in reporting the percentages, we previously reported the proportion of rates falling within 2-uncertainty range. We have corrected this to report the proportion of individual mass changes falling within our uncertainty estimate. We only report the overall proportion of estimates falling within the uncertainty and do not report this per satellite technique as we only have one input-output estimate and thus we feel that reporting the percentages per technique would not be representative.

**Action:** We have corrected the corresponding text as:

Overall, we find that the vast majority of individual estimates of annual rates of mass balance included in this study fall within the uncertainty bounds of our reconciled estimate given their respective individual errors, with 96 %, 83 %, 83 %, 76 %, and 81 % of those annual rates of mass change falling within the reconciled uncertainty range at the GrIS, AIS, APIS, EAIS, and WAIS, respectively.

**Figure 4:** I have been confused by this; is one standard deviation (sigma) the uncertainty or is this the uncertainty computed from step 3 iii)? I do not think that reviewer #2 comment RC2.3 has been adequately addressed and there is still a need to clarify much of these metrics throughout.

**Response:** This is the uncertainty computed from step (iii), we added the formula used to calculate this uncertainty in the revised manuscript. Sigma here refers to the uncertainty and not to the standard deviation. We have clarified this throughout the manuscript and no longer use the notation  $\sigma$  in the different captions and only show the uncertainty estimates instead of different ranges (1\*uncertainty, 2\*uncertainty, 3\*uncertainty). When we make use of the standard deviation it is only

when comparing estimates together to look at the spread in rates of mass balance within or between satellite technique and we never use the standard deviation as an uncertainty estimate.

**Action:** We modified the caption of Figure 4 as:

Cumulative ice sheet mass changes. The shadings represent the associated uncertainties and are calculated following the procedure described in Section 3 (iv). The dashed lines show the results from our previous assessments (IMBIE-2).

**Section 5.2** Comparisons to sea level contribution and projections of future sea level rise: The discussion here is out of scope for this journal and should be cut out along with Figure 5 and Table 3 (see ESSD aims and scope: [https://www.earth-system-science-data.net/about/aims\\_and\\_scope.html](https://www.earth-system-science-data.net/about/aims_and_scope.html)).

**Action:** We have removed this comparison and the related figure and table.

**Section 5.1** is questionable whether it is within scope of ESSD, although it might be beneficial to explain more clearly what was different about the processing scheme in this study—likely in the Methods section—and what has changed in the individual mass balance estimates in Section 2.1. The sea level contributions described in 5.2 can simply be added to Table 2, thus preserving these results and presenting them in a more clear and comprehensive way.

**Response:** We felt the discussion in Section 5.1 was appropriate to include as part of ESSD's living data process – due to the nature of the community submission processes relatively small differences may arise between updated versions of the dataset and thus we believe that it is important to report evolutions of our dataset. As we also foresee future updates to our method (as described in the roadmap) this section will be a natural part of the paper in future, so we include it here to begin the process of tracking the changes that have taken place.

**Action:** In Table 2, we replaced the fractions in GMSL with the sea level contributions.

**Section 5.3** is helpful as it describes limitations of the data. I am not sure that a roadmap for further work is within the scope of ESSD, but I can see the benefit of it here and I'd say it can be kept.

**Response:** Thank you, we have kept this section.

The inclusion of peripheral glaciers is a critical weakness of this analysis and that should be made clear. It would be better to see these limitations presented upfront when describing the methods in Section 3.

**Response:** We have addressed this at the end of Section 3, please see our previous response detailing the changes made.

**P22, L 447:** It says you used 26 mass balance estimates for Greenland and 24 for Antarctica, but this is inconsistent with what is described in Section 2.1 (27 for Greenland, 23 for Antarctica). Please correct this.

**Action:** Thank you, we have corrected this.