

Earth Syst. Dynam. Discuss., referee comment RC1
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Comment on esd-2021-80

Anonymous Referee #1

Referee comment on "Trends and uncertainties of mass-driven sea-level change in the satellite altimetry era" by Carolina M. L. Camargo et al., Earth Syst. Dynam. Discuss., <https://doi.org/10.5194/esd-2021-80-RC1>, 2021

marp: false

This work compares different estimates of ocean mass contributions to sea level rise.

These contributions are themselves derived from different estimates of contributions to ocean mass (ice sheets, glaciers, land water storage) which are propagated to SL fingerprints using the SLE.

This work in itself, and a comprehensive documentation of resulting ocean mass trends and discrepancies between estimates at the regional level, would deserve a publication.

The authors also derive uncertainties on ocean mass trends which they separate into temporal uncertainty (the amount of uncertainty coming from the natural variability in records), spatial-structural (coming from the fact that the position of sources is not exactly known) and intrinsic (uncertainty in the data itself, the way we measure it for example). This represents a large part of the paper (methods are well documented and the results well presented).

My main concern about this paper is that the representativity (or accuracy) of these uncertainties is not discussed, despite what appears (to me at least) to be inconsistencies across datasets. I'll try to give a few examples below:

* Section 3.1 and Figure 2 are dedicated to the noise model selection. No information is provided about the goodness of fit of the selected (optimal) noise model. As far as we are told, all models could largely fail at representing the variability in the records (I'm pretty sure this is not the case, but please provide a metric). This could help with the interpretation of Figure 2 where discrepancies between noise models fitted to different

datasets are striking: to me this means that the datasets are unable to observe the same processes, even between two GRACE based datasets. A synthetic table of datasets resolution/content could be useful here (rather than having to refer to Appendix A).

* Section 2.2.2 describes the uncertainty propagation rules used in the paper. I'm concerned by two points here:

1. when considering spatial-structural uncertainties the authors scale the fingerprints to 1 mm/yr amplitude to avoid too much spread across an ensemble of only 4 members. How much uncertainty reduction does this scaling provide? This should be documented.

2. regarding the intrinsic uncertainty propagation, the authors use a no-covariance hypothesis. There are many ways error covariances could affect GRACE/GRACE-FO measurements (instrument ageing, operation mode switches). I understand the scope of the paper is not to revisit GRACE error characterization but this could be mentioned?

* It is unclear to me if all datasets are consistent within the estimated uncertainties or if there remains regions where this is not the case?

* I have the feeling that the uncertainty estimation presented here is likely a lower bound to the true uncertainty on the ocean mass contribution to SL. Could you comment on that?