

Ocean Sci. Discuss., referee comment RC2  
<https://doi.org/10.5194/os-2021-106-RC2>, 2022  
© Author(s) 2022. This work is distributed under  
the Creative Commons Attribution 4.0 License.

## Comment on os-2021-106

Anonymous Referee #2

---

Referee comment on "On the uncertainty associated with detecting global and local mean sea level drifts on Sentinel-3A and Sentinel-3B altimetry missions" by Rémi Jugier et al.,  
Ocean Sci. Discuss., <https://doi.org/10.5194/os-2021-106-RC2>, 2022

---

General: I appreciate having been given the opportunity to review a preprint of "On the uncertainty associated with detecting global and local mean sea level drifts on Sentinel-3A and Sentinel-3B altimetry missions" by Jugier et al. The paper is well organized and written, and provides an excellent overview of sources of uncertainty in satellite altimetry measurements of sea level trends, differences between missions, and implications for resulting sea-level rise estimates. It rigorously quantifies drift in GMSL trends between satellite altimetry missions and by comparison to tide gauge records, allowing for some of the uncertainty to be accounted for, and guiding future improvements in altimetry and uncertainty analysis. The work provides important new insight to uncertainty in satellite altimetry-based inferences of sea level, which is crucial for understanding future sea level changes and associated impacts, as well as the use of altimetry data to support modelling. I provide only some minor specific comments and suggested technical corrections.

### Specific comments:

Lines 33-35: It is not immediately clear what is meant by "At the local scale", although the authors refer to a scale of 2400 km in Line 18. I suspect the authors are referring to the fact that there are spatial variations in sea-level rise across the global oceans. If so, I suggest changing this sentence to begin "Rates of sea-level rise vary spatially in the range 0 to 6 mm yr-1...". Alternatively, explain what is meant by local scales, e.g. "Over distances of 2400 km, sea-level rise rates vary by between 0 and 6 mm yr-1..." I note that later in the paper, three different local scales (240 km to 2400 km) are referred to. It is not clear which of these local scales the range 0-6mm/yr applies to.

Lines 73-74: Again, it is not quite clear what the authors mean by "local scales". I would suggest to change this to say something like "...we assess spatial variability in the drift in sea level estimates"

Line 109: It is not clear why a resolution of 1 degree latitudinally and 3 degrees longitudinally are selected for this method. Could the authors clarify this choice of resolution, and comment on the potential influence of grid resolution and spatial collocation of altimetry tracks to the reference grid on the resulting analysis and MSL drift estimates?

Line 321: Clarify the reference time period used to determine trends in Section 4.4

Lines 354-358: Do these findings suggest that some spatial averaging/smoothing is generally needed or recommended to obtain robust sea-level estimates?

Line 380: Clarify what is meant by local scales here.

Technical corrections:

Line 9: "It could have an impact on sea level rise of a few tenths of mm yr-1." This seems to imply the drift impacts the actual sea levels, which of course is not the case. I suggest changing to something like: "It will affect the accuracy of sea level sensing, which could result in errors in sea-level change estimates of a few tenths of mm yr-1"

Line 12: Global Mean Sea Level should be written in full here, since it is the first time the GMSL acronym is used.

Line 25: Suggest to insert the word "lagging" before "indicator" in the statement "GMSL rise is a widely accepted indicator for the rate at which the climate is changing"

Lines 34-45: The statement "...sea level is rising everywhere over the globe" is not necessarily true depending on the reference frame and location. For example, at coastal locations experiencing post-glacial rebound (e.g. the Canadian High Arctic), sea levels are actually falling relative to the land. Some clarification is probably needed.

Line 56: Suggest to insert the word "inferred" before "GMSL" in the statement "...with a direct impact on the GMSL trend of about 0.3 mm yr-1."

Line 109: There appears to be too many ")" in this sentence.

Lines 152 and 153: Insert space after GMSL (two instances)

Table 1: GIA errors are cancelled out

Table 1 footnote: All uncertainties reported are based on Gaussian distributions

Table 2: see comments on Table 1 – same apply here.

Line 243: I think this line should be altered to state “These results highlight a significant difference in GMSL trends estimated from S3A and Jason-3...”

Line 373: I did not find the cited Poisson et al. (2018) reference in the bibliography. Perhaps this should be Poisson et al. (2019)?

Lines 409-468: Several of the references appear to be incomplete, lacking information needed to locate the publication.