

Reviewer 2

Reviewer Comment: This paper utilises in-situ measurements in the Rangiroa Atoll in French Polynesia to assess SWOT derived SSH and SWH measurements. By comparing the SWOT observations with rare sea level and wave buoys, they show the value of the high resolution capabilities from SWOT and the future possibilities of studying these atolls. It is very well written and contains details of the instruments to understand the degree to which the assessment is able to function, and would be very valuable for the scientific community. I recommend some minor revisions that mainly relates to clarification on a few questions

Response: We are grateful to the reviewer for taking time to carefully review the manuscript and give detailed and constructive comments, which has greatly helped to improve this paper. Below is our point-by-point response to each respective comment.

Overall comments

Reviewer Comment: The central lagoon is surely large enough that the coastal contamination from nadir altimetry would be minimal directly in the center (with a width of 14 km)?

Response: We agree that coastal contamination is expected to be minimal in the center of the lagoon given the distance to the reef rim. It should be noted yet that isolated patched reefs are present on the western and eastern part of the lagoon and could possibly contaminate the radar signal. This feature is now added in Section 2.

Reviewer Comment: Line 34: surely this correlates with the SSH in the outer side of the island chain, however the signal might have a different temporal component inside of the lagoon, which would then be unable to be compared with conventional altimetry?

Response: Indeed, comparing altimeter measurements on the outer side of the atoll with tide gauge measurements on the inner part of the atoll (i.e. in the lagoon) is not necessarily meaningful because the tidal signal is severely distorted along the narrow reef channels. For extensive atoll such as Rangiroa, conventional altimetry is however able to provide valid SSH records in the central part of the lagoon. Yet the separation distance between the tide gauge and the altimeter records can still induce some differences, making GNSS buoys particularly useful to validate altimeter measurements (see for instance Chupin et al., 2023).

Reviewer Comment: How do you compute the mean using the 250 m Unsmoothed data, when it is not fixed to a constant geographical grid? Do you grid it to another grid, or interpolate onto specific locations? And at what resolution?

Response: The mean SSH field is interpolated on a fixed 100-m resolution grid. This information was missing in the manuscript and has now been added in Section 4.1.

Reviewer Comment: What is the expected cause of the large deviations that span in the order of 15 minutes that are present in the Nano-Cyclopée and not in the Tide gauge (figure 5)? It did not seem to be addressed in the text, and the GNSS buoy and Nano-Cyclopée both seem to detect them.

Response: In Appendix 6.1, the two components of the Nano-cyclopée SSH signal (GNSS altitude and air draft) are analyzed separately in order to better characterize uncertainties in GNSS data. The large deviations shown on Figure 5 can be attributed to the GNSS signal only but their origins remain uncertain. At this stage we can only hypothesize that they likely result from changes in the GNSS satellite constellation, errors in atmospheric corrections or limitations of the PPP method. These errors are now more clearly pointed out in the description of Figure 5, and a reference to Appendix 6.1 has been added.

Despite significant fluctuations of the GNSS-based measurements with local amplitudes up to 7cm and periods around 15-20min (see Appendix 6.1 for a discussion on GNSS-related errors), the slowly-varying part of the signal agrees very well with the tide gauge measurements.

Reviewer Comment: In figure 8, it seems that there is some kind of smoothing or cubic interpolation, as you have a SWOT mean profile on land, which might cause coastal contamination and explain the large positive anomalies when compared to Nano-Cyclopee. This relates to the missing explanation of the gridding of the SWOT unsmoothed data, and would be an important point in the utilisation of the data in these regimes. Additionally for figure 8, the grey and blue colours are not explained in the legend, and the profiles have values outside of the lagoon, that Fig 8a does not illustrate, that would be helpful. The legend would be more easily explained if it said Mean SWOT as well.

Response: No cubic interpolation or smoothing has been applied to the SWOT SSH data presented on this figure, but the linear interpolation of the original 250-m Unsmoothed data onto a fixed 100-m resolution grid could have slightly smoothed the mean SSH profile. Yet, the large positive anomalies that is observed over and beyond the emerged reef part (grey zone) mostly reflect deviations in the raw observations at similar distance, not interpolation error, and we can deduce from this plot that the 250-m Unsmoothed data start to degrade around 300m from the coast. This is now indicated in Section 5.3.1. Moreover, Figure 8 has been updated in order to improve clarity based on the above suggestion.

Reviewer Comment: Minor comments:

- Line 8: Maybe add a short note about where Rangiroa atoll is here also
- Line 10: Outperforming by how much?
- Line 72: it would be very helpful if the Avatoru and Tiputa passes were marked on the map in Figure 1(right), as the coastline (black line) makes it seem like there is quite a lot of passes to the open ocean.
- Line 268: Just to ensure readability, I would recommend stating that the bar in equation 5 is the mean.
- Figure 7: Missing unit on the time axis, is it minutes? Or hours? Or local time?
- Line 458: "collocated"

Response: All these minor comments have been considered and appropriate changes in the manuscript have been applied.