

Reviewer #2 (<https://doi.org/10.5194/egusphere-2025-6364-RC2>)

The paper is relevant to understand possible effects and limitation in the configuration chosen for S3NGT. Unfortunately the quality of writing and the definition of the parameters is not accurate enough for the topic. A re-reading in a geodetic aim is highly needed. There is a lack of precision spread in the paper description.

Detailed Comments:

Line 102: revise the definition of parameters in Eq. (1). The "orbit" should be the radial distance between satellite and ELLIPSOID, otherwise how can be the Mean Sea Surface defined as usual above the ELLIPSOID? If is above the geoid is not the MSS but the MDT. Also the other parameters "sea surface height" are above the ELLIPSOID. It seems that here the geodetic definition is lost and misused in the all manuscript

Corrected, the manuscript has been corrected consequently (L.105-106) with track change:

"[...] where Orbit is the radial distance between the satellite's center of mass and the reference ellipsoid, Range is the distance between the satellite and the sea surface [...] Mean Sea Surface is the time-averaged sea surface height referenced to the ellipsoid, from which sea level anomalies are derived."

Line 119: MSL is defined here as acronym and used already as "MeanSeaSurface" in line 102.

Corrected, the use of the term "MSL" has been removed from the paper.

The manuscript has been corrected consequently (L.121-122) with track change:

"For each mission, along-track SLA data are aggregated into regular 3° x 3° spatial grids to generate SLA grids."

Line 128: Differences of MSL grids does not give a SLA (sea level anomaly). SLA above which surface, I guess the MSS. But the differences of two MSLs are still above the ellipsoid. What is really computed and above which reference surface should be correctly described, otherwise results are not reproducible.

To correctly describe exactly what is being computed and avoid any confusion regarding the reference surfaces, we have updated the text:

“From these SLA grids, we calculate the difference between the two missions for each 12-day window, yielding a series of Δ SLA grids. By taking a weighted spatial average of each Δ SLA grid, we obtain a time series of global mean SLA differences between the two missions. The temporal mean of this time series provides an estimate of the global mean SLA offset.”

Line 134: difficult to interpret the bias if the reference surface is sometime the ellipsoid and sometime a not well defined MSS.

We understand the reviewer's difficulty here, which stemmed directly from our inaccurate use of "MSL" in the original draft. As detailed in our previous responses (see our replies regarding Eq. 1 and the general terminology table), we have fully corrected and harmonized the terminology throughout the revised manuscript.

Line 144: regional offset map is not defined

Corrected, the manuscript has been corrected consequently (L.131-132) with track change:

“Within each grid cell, we extract a time series of the Δ SLA values across the observation period. The temporal mean of these localised time series generates a spatially resolved map of regional SLA offsets.”

And L.143-144:

"The first method uses the spatial variance in regional SLA offsets to provide a single global uncertainty value, capturing the overall spread of the regional SLA offset estimates."

Line 145: SLA differences between what and above which surface should be defined at start of the paper.

Corrected, the manuscript has been corrected consequently (L.145-146) with track change:

"The second method estimates regional uncertainty at each grid point by analysing the temporal variability of SLA differences between two missions. This approach incorporates the autocorrelation structure of the time series to ensure more realistic uncertainty estimates."

Line 156: "time series of MSL" is unclear, how can be the MSL variable in time? Probably a wrong and inaccurate use of words, again.

Corrected, the manuscript has been corrected consequently (L.156-157) with track change:

"Another way to calculate the uncertainty of the regional SLA offset is to compute the standard deviation of each temporal time series of SLA in each grid cell"

Line 167: SSHA, and now the SSHA is used but not defined. The authors use probably the names selected for the variables in the netcdf, which is unfortunate and misleading, but we are in a paper. The authors should not confuse further the readers and tell what is the difference with the SLA used a few lines above.

Corrected, all mentions of SSHA have been changed to SLA.

Line 169: if the satellites are two, the crossover is called dual-crossover in the literature.

Corrected, the manuscript has been corrected consequently (L.166-170 and all mention of "crossover") with track change:

"To quantify the variance of oceanic variability and measurement errors over short time intervals, we analysed dual-crossover differences between SWOT's KaRIn swath data and Sentinel-3A/3B nadir data (Δ SLA). This analysis is based on almost one year of data from SWOT's science phase, leveraging a high number of dual-crossovers and an extensive spatial coverage. A dual-crossover is defined as the intersection of ground tracks from two different satellites, enabling the comparison of spatially colocated measurements, although acquired at different times."

Lin 185: still not defined the reference surface for SSHA.

Corrected, all mentions of SSHA have been changed to SLA.

Line 231: here SLA again

Unchanged, the notations have been homogenised in the paper, and only the parameter SLA has been kept.

line 284: without a clear definition of parameters SLA, SSHA, MSL, MSS the paper is unclear and results and discussion very difficult to follow.

We thank the reviewer for highlighting this critical point. We agree that the mixed use of terms like SLA, SSHA, MSL, and MSS created unnecessary confusion regarding the geodetic reference surfaces. To ensure strict geodetic accuracy and readability, we have completely harmonized the terminology throughout the revised manuscript.

Specifically, we have removed all instances of "SSHA" to avoid introducing multiple acronyms for the same variable. Furthermore, we have removed the use of "MSL" (Mean Sea Level) when referring to our cycle-by-cycle spatial grids, as this implied a climatological or temporal average that did not reflect our methodology. All of these terms have been corrected to consistently use "SLA" (Sea Level Anomaly).

These terminology updates, along with their corresponding notations, are summarized in the table below:

Term used in the paper	Corrected term	Notation
Regional MSL grid	SLA grid	SLA(lon, lat)
RMSL differences	Difference of SLA grids	Δ SLA(lon, lat)
Global Mean Sea Level (GMSL) differences	Global mean SLA differences	
RMSL offset	Regional SLA offset	
GMSL offset	Global mean SLA offset	
Sea Surface Height Anomaly (SSHA)	Sea Level Anomaly	SLA
SSHA differences (Δ SSHA)	SLA differences	Δ SLA