

Anonymous Referee on “Estimation of geostrophic current in the Red Sea based on Sea level anomalies derived from extended satellite altimetry data” by Ahmed Mohammed Taqi et al.

Referee

Thank you very much for your interest in the manuscript, and for spending your effort and time in the review, comments, and suggestions, which helped in improving the manuscript. The manuscript was modified based on the Referee comments. The responses to the comments are described below.

General Comment:

In this article the authors use data from Jason-2 to extend SLA observations from AVISO towards the coasts of the Red Sea. Altimetric products from AVISO are commonly used to describe the open ocean dynamics but their resolutions are coarse near the coasts. The combined satellite dataset is validated with three tide gauges situated along the western coast of the Red Sea and with geostrophic surface velocities estimated from CTD. This new merged satellite product shows good agreement with the other available dataset and allows the authors to have better observations of the SLA C1 along the coasts. Once validation of the products, the authors describe the monthly climatological evolution of the the SLA and surface currents, exhibiting the evolution of mesoscale eddies, in size, position and rotation. A month to month analysis of the surface fields describe the observed eddies and link them to the structure previously studied in the scientific literature. I think this article is well written, the merged dataset allows us to understand the climatological circulation in the Red Sea, where previous satellite dataset allowed only a partial coverage linked to the geography of the basin.

Sub comments:

Sub-comment: Still it lacks some informations of the dataset used to validate the data and the justifications of some diagnosed.

Reply: The information about each cruise is added in the manuscript. The 2010 cruise data are used entirely, as suggested by reviewer.

Sub-comment: Nevertheless I felt that the last part of the article did not emphasize the main contribution of this study : the calculation of surface currents and SLA along the coast. As I wrote above, the authors did a good job comparing their results with previous studies, and where they

agree, but it would be important in my opinion to add informations on where it provides new informations, particularly along the coasts.

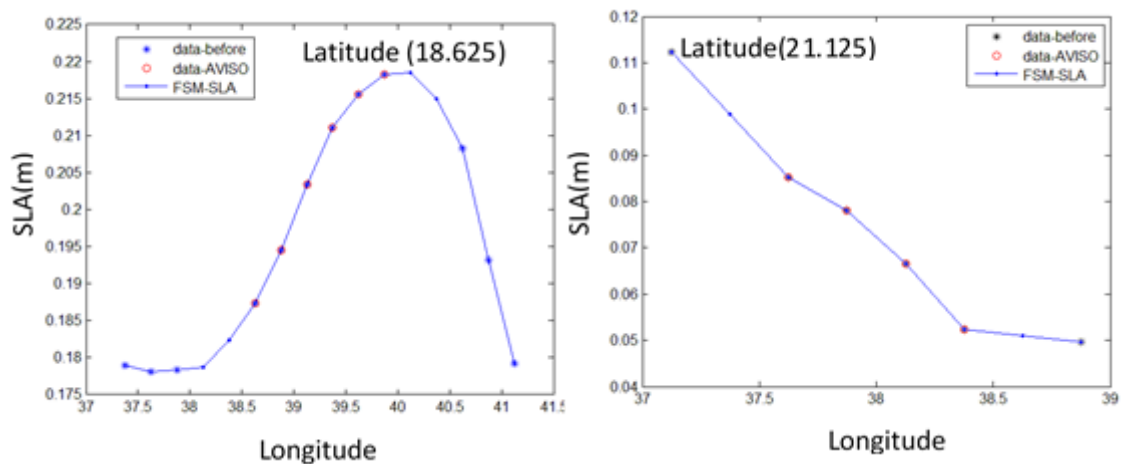
Reply: The revised manuscript was modified accordingly, wherever was needed.

Sub-comment: The conclusion is a little short, and adding these informations will help wrapping the article nicely.

Reply: The conclusion was modified accordingly.

Comment [1] The SLA from AVISO gives measurements offshore, while the FSMSLA method extends these measurements toward the coasts. I wonder how are the discontinuities between dataset removed or smoothed ?

Reply: The AVISO data was removed near the coast using the polygon. The blank area was replaced by the FSMSLA data with space leaving between the two data set according to the width of the sea either one or two grid cells. This gap was filled using kriging interpolation method to smooth the dataset. See figure below which include two example.



Comment [2] On figure 2 the authors show the correlation between the AVSIO and FSM data, how are they calculated where the AVSIO dataset does not provide measurements (again along the coast)

Reply: FSM data was gridded into $0.25^{\circ} \times 0.25^{\circ}$ and the correlation was estimated for entire Red Sea area. Since FSM data showed better resolution towards the coast, it has been used instead of AVISO data near the coast.

Comment from Results:

Comment [1] I suggest separating this section in two part, a first with the validation of the method (down to line 17), and a second with the analysis of the SLA.

Reply: The revised manuscript is modified accordingly

Comment [2] About the CTD: on figure 4 the authors display different part of the Red Sea a different period comparing AVSIO and the FSM-SLA. What are the justifications for these specific area and periods. I think providing a quantitative analysis would help validating the approach.

Reply: The selection of these areas and periods were based upon the available cruise data. In the revised manuscript, the 2010 cruise dataset was entirely compared with our data, which cover larger area

Comment [3] The visibility of the geostrophic currents and eddies name of figures 5 and 6 have a low visibility. As they exhibit the main results of the study I suggest remapping them by adding a light opaque filter on the SLA and then adding the arrows and names. The same goes for figure 4 where the arrows are difficult to see.

Reply: The visibility of the geostrophic currents and eddies names of figures 5 and 6 arrows and names has been changed.

Comment [4] Figure 7 wrap up the paper with a schematic representation of the currents, but, as the authors state, the monsoons have a strong impact on the Red Sea, particularly on its southern edge. I suggest adding a schematic representation for the winter and summer seasons in order to point out the differences in circulations.

Reply: The annual schematic has been changed to the winter and summer seasons see figure 10, in the revised manuscript.