

Can SMOS observe mesoscale eddies in the Algerian basin?

The circulation in the Algerian Basin is characterized by the presence of fresh-core eddies that propagate along the coast or at distances between 100-200 km from the coast. Significant improvement in the processing of the Soil Moisture and Ocean Salinity (SMOS) data have allowed to produce, for the first time, satellite Sea Surface Salinity (SSS) maps in the Mediterranean Sea that capture the signature of Algerian eddies. SMOS data can be used to track them for long periods of time, especially during winter. SMOS SSS maps are well correlated with in situ measurements although the former has a smaller dynamical range. Despite this limitation, SMOS SSS maps capture the key dynamics of Algerian eddies allowing to retrieve velocities from SSS with the correct sign of vorticity. These results have been recently published in *Geophysical Research Letters* (Isern-Fontanet et al. 2016).

Three years (2011-2013) of SSS were derived from Brightness Temperatures (BT) measured by SMOS and provided by the European Space Agency (ESA). SMOS data were processed according to Olmedo et al. (2016) and used to generate a SSS map by means of a classical scheme of objective analysis applied over time periods of 9-days. Besides, numerical simulations of the circulation in the Mediterranean Sea have confirmed the strong tendency of the Sea Surface Temperature (SST) and SSS gradients to align (Isern-Fontanet et al. 2016). This property has been exploited to improve SSS maps using the methodology proposed by (Olmedo et al. 2016a), that combines information from SSS and SST. For this study, satellite-derived SSS were merged with Reynolds SST downloaded from NOAA. The resulting fields are available [here](#). In addition, Absolute Dynamic Topography (ADT) maps provided by AVISO have been used to assess the capabilities of SSS maps.

The film below shows the temporal evolution of SMOS SSS maps with the SSH contours over-plotted. The center of two Algerian eddies is identified with black dots. Although some problems are still evident in these images (temporal variation of the SSS amplitude, disappearance of some eddies) there is a good agreement between the patterns seen in SSH and SSS anomalies for the strongest signals. This coherence, however, has a clear seasonal signal with the best conditions to observe Algerian eddies being in winter.



The capability to detect the signature of Algerian eddies opens the door to overcome the sampling limitations of current altimetric observations (Pascual et al. 2006) through the uses of SMOS observations. We have tested this idea by repeating the study of Isern-Fontanet et al. (2006) with the new SSS fields. The image below shows SSH anomaly with the geostrophic velocities overplotted (left), the SST anomaly with the velocities derived from SST (middle), and the SSS anomaly with the velocities derived from SSS (right) corresponding to 12 May 2011. As it is evident from the figure only the SSS is able to reproduce the correct polarity of Algerian vortices as already discussed by Isern-Fontanet et al. (2014).

Yes, for the first time it has been possible to detect Algerian eddies in satellite-derived SSS maps derived from SMOS measurements. It has been also shown that the capability to detect such vortices is stronger during winter and the strong potential for SMOS measurements for computing surface currents.

References

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