CAN SMOS OBSERVE MESOSCALE EDDIES IN THE ALGERIAN BASIN?

J. Isern-Fontanet [1]*, E. Olmedo [1], A. Turiel [1], J. Ballabrera-Poy [1] and E. Garcia-Ladona [1]
[1] Institut de Ciencies del Mar (CSIC) - jisern@icm.csic.es

Abstract
The circulation of the Mediterranean Sea is dominated by the spread of fresh waters incoming from the Atlantic Ocean. Algerian eddies are accountable for the mixing between these newly entered waters and the saltier resident Mediterranean ones. New improvements in the processing of Soil Moisture and Ocean Salinity (SMOS) Level 2 (L2) data have allowed to produce new satellite-derived Sea Surface Salinity (SSS) maps able to capture, for the first time, the signature of Algerian eddies and track them in time. It has been shown that the capability to detect such vortices is stronger during winter.

Keywords: Remote sensing, Algerian Basin, Salinity

Data
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 [1] and used to generate an 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 [2]. This property has been exploited to improve SSS maps using the methodology proposed by [3], that combines information from SSS and SST. For this study, satellite-derived SSS were merged with Reynolds SST downloaded from NOAA. In addition, Absolute Dynamic Topography (ADT) maps provided by AVISO have been used to assess the capabilities of SSS maps.

Results
First, the vorticity field derived from altimetric maps and the SSS anomaly were compared. Here, the SSS anomaly has been computed as the band-pass filter of SSS using cut-off wavelengths of 100 and 200 km. As it is evident from the example in figure 1, there is a good agreement between the patterns seen in vorticity and SSS anomalies. Besides, anticyclonic vortices were identified in altimetric SSH measurement using the procedure proposed by [4]: a vortex core is the simply connected region with values of the Okubo-Weiss (W) parameter smaller than $-0.2\sigma_W$ and the same sign of vorticity. This definition does not capture the whole vortex but its core [4]. Once anticyclonic vortices were identified in SSH fields, the probability of having negative SSS anomalies inside anticyclonic eddies was evaluated. Results showed that, it is of the order of 0.7 in winter (December-March), which contrasts with the probability of having negative anomalies outside eddies (less than 0.5). On the contrary, the probabilities during other periods of the year are of the order of 0.5 in both cases.

Conclusion
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.

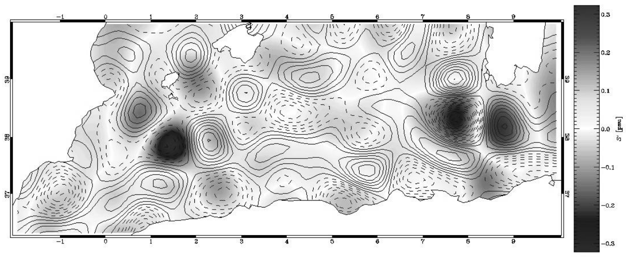

Fig. 1. Figure 1: SSS anomaly with vorticity contours overplotted. Solid (dashed) lines correspond to positive (negative) vorticity.

References
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