RECONSTRUCTION OF OCEAN CURRENTS AT SCALES SHORTER THAN 30 KM FROM EXISTING SATELLITE OBSERVATIONS: EDDIES ALONG THE IBERIAN COAST

J. Isern-Fontanet [1]*, E. Garcia-Ladona [2], C. Martin-Puig [3], J. Jimenez Madrid [1], A. Turiel [4] and O. Chic [1]
[1] Institut de Ciencies del Mar (CSIC) - jisern@icm.csic.es
[2] Institut de Ciencies del Mar (CSIC)
[3] NOAA - NESDIS - STAR - OPB
[4] Institut de Ciencies del Mar (CSIC)

Abstract
Along-track altimetric measurements of Sea Surface Heights (SSH) are very well suited to quantify across-track currents. However, the spatial resolution of derived 2D velocities is restricted to scales above 100-150 km and the limited number of altimeters can lead to errors in the location of currents. On the contrary, infrared measurements of Sea Surface Temperature (SST) are well suited to locate flow patterns but it is difficult to extract quantitative estimations of ocean currents.To overcome the previous constrains we have developed a methodology able to provide enhanced 2D surface currents. Our approach opens the door to retrieve the velocity field associated to structures smaller than 30 km, not accessible through the standard SSH maps. Results are compared with drifting buoy trajectories showing good agreement.

Keywords: Remote sensing, North-Western Mediterranean, Coastal processes, Mesoscale phenomena

Data

We used infrared measurements provided by AVHRR downloaded from the Coastal Ocean Observatory hosted at the Institut de Ciències del Mar (CSIC). Due to their lower levels of noise we used Brightness Temperature (BT) from the Channel 4 instead of SST. Infrared data were processed according to [1]. In situ measurements consisted on a set of surface and CODE drifters released close to the coast of the Iberian Peninsula.

Results

First, the trajectories of surface drifters were compared to infrared images to identify those drifters that were captured by structures smaller than 30 km. Then, surface currents were estimated from infrared measurements using the transfer function approach described in [2]. In this study, it was also shown that the SQG approach was reasonable good at wavelengths below 100 km (see [3] and references therein for more details about SQG and [2] for its application to the Mediterranean). Therefore, we used the SQG transfer function for this study. The resulting fields were compared to the trajectories of drifters showing a good agreement (see figure 1). A more quantitative comparison was obtained by interpolating the velocities derived from thermal images onto drifter trajectories. Results for the example shown in figure 1 exhibited a linear correlation of 0.9.

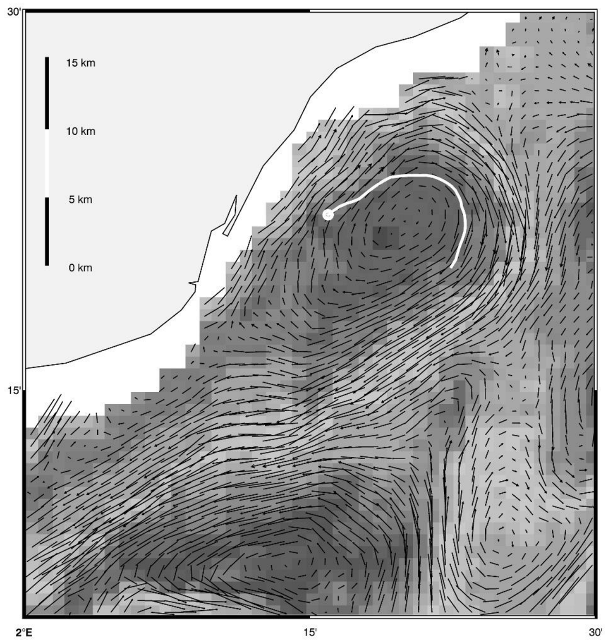

Fig. 1. Brightness temperature with the velocity field derived from it overplotted. The white line corresponds to the trajectory of a surface drifter. The White dot indicates its starting position

References
1 - Isern-Fontanet, J. and E. Hascoet (2014) Diagnosis of high resolution upper ocean dynamics from noisy sea surface temperatura *J. Geopys. Res.* 118 1—12
2 - Isern-Fontanet, J., M. Shinde, and C. Gonzalez-Haro, 2014: On the transfer function between surface fields and the geostrophic stream function in the mediterranean sea. J. Phys. Ocean, 44, 1406–1423, doi:10.1175/JPO-D-13-0186.1
3 - Isern-Fontanet, J., B. Chapron, P. Klein, and G. Lapeyre, 2006: Potential use of microwave SST for the estimation of surface ocean currents. Geophys. Res. Lett., 33, L24608, doi:10.1029/2006GL027801.