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Surface signature of a meddy while interacting with the Azores current

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A Mediterranean water eddy (meddy), initially singled out in the south-western part of the Iberian basin with AVISO altimetry data, was later surveyed with 75kHz ADCP data collected by RV "Almirante Gago Coutinho" at the end of August 2010. The azimuthal velocity of the surface anticyclonic vortex was of 15 cm s-1 and was strongly intensified below 600 m depth, reaching 45 cm s-1. The deep dynamic structure was identified as the core of a meddy. Assuming that the meddy is circular, it was estimated that the ADCP section passed about 5 km north of the meddy center. The dynamic radius of the meddy core was estimated to be 10-15 km, which is the second baroclinic Rossby radius of deformation (see also Paillet et al., 2002). Above the meddy, in-between 500 and 600 m depth, the dynamic radius of the anticyclonic structure sharply increased to 15-20 km, and then was gradually increasing further up to reach 20-25 km at the sea-surface (close to the first baroclinic Rossby deformation radius). This transition layer at 500-600 m was also marked with the maximum vertical gradient of the horizontal velocity, suggesting in vertical the double-core eddy structure. The axis of the surface eddy was shifted 15-20 km to the west from the meddy center. The dynamic structure of the upper 500-m layer was identified as a "meddy surface signal", which has been suggested to be a stand-alone structure coupled with a meddy (Bashmachnikov et al., 2009).

The intensity of the meddy surface signal is a function of the background conditions and strongly varies in time. During the 3 months preceding the cruise, the meddy surface signal, identified as a local sea-level anomaly (SLA) in the gridded AVISO altimetry as well as in the along-track data, was detected moving south-west, approximately along an altimetry track. During May 2010, before interaction with the Azores Current (AzC), the SLA over the meddy was of the order of 5-9 cm. It decreased to 3-5 cm in the end of June, as the meddy first interacted with a meander of the AzC. During July-August the meddy became aligned with the meander and its surface signal reached its maximum of 10 cm. At the time of the cruise the downward intensification of the anticyclone structure above the meddy suggests that it was not an AzC meander, but rather a dynamic structure generated by the moving meddy. Soon after the cruise the meddy got expelled from the AzC jet westwards (see Vandermeirsch et al., 2003) and its surface signal became undistinguishable from the background noise. Therefore, during interaction of a meddy with a jet current, the meddy surface signal, after its initial enhancement, may be lost.