The contribution and influence of coherent mesoscale eddies off the North-West African Upwelling on the open ocean

Anass El Aouni[1], Khalid Daoudi[1], Hussein Yahia[1] and Khalid Minaoui[2]

[1] Geostat team, Inria Bordeaux Sud-Ouest, Talence, France anass.el-aouni@inria.fr
[2] LRIT URAC 29, IT Rabat Center, Faculty of sciences, Mohammed V University in Rabat, Morocco

Eastern Boundary Upwelling zones include some of the most productive ecosystems in the world, particularly the North-West (NW) African upwelling which presents one of the world's major upwelling regions [1]. This latter is forced by the equator-ward trade winds which are known to exhibit mesoscale instabilities [2]; thus, in addition to upwelled cold and nutrient-rich deep waters, significant energy is transferred into mesoscale fronts and eddies in the upper ocean. Oceanic structures of type eddies are well know to stir and mix surrounding water masses. However, they can also carry and transport organic matter and marine in a coherent manner. Here, we are interested in those that remain coherent. Several authors have investigated these oceanic structures off the canary islands, however, this has been done in an Eulerian perspective where persistent correlations between flow quantities are sought in a fixed spatial domain. In the present work [3], we aim to establish a Lagrangian study of these eddies to understand their impact and contribution to the open ocean. Our approach to analyze such coherent eddies is based upon the use of our robust approach from nonlinear dynamics theory [4], which is capable of identifying coherent vortices and their centers in an automatic manner. The role of these mesoscale eddies is investigated based on a statistical study of eddies properties off NW African margin (cyclone/anticyclone, their lifetimes, traveled distance, transnational speeds, quantity of water masses transported to the open ocean). This statistical study is carried out over a sets of 24 years (spans from January 1993 to December 2016) of sea surface velocity field derived from satellite surface altimetry under the geostrophic approximation

References

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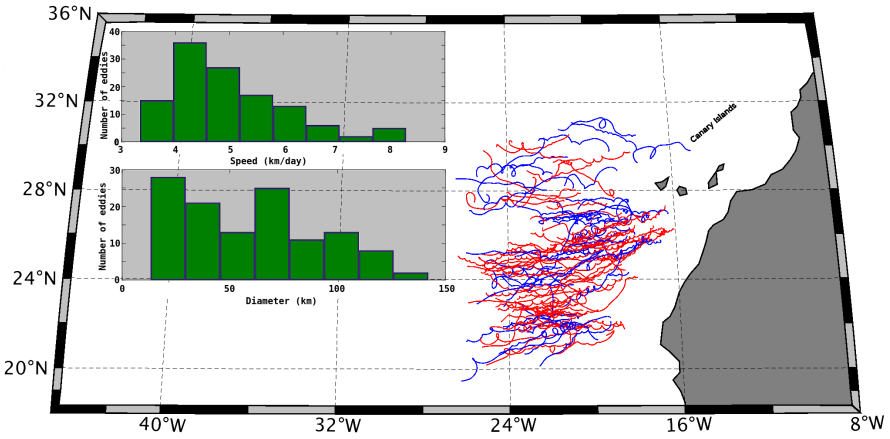

Figure 1: Trajectories, diameters and mean-averaged speed of the coherent mesoscale eddies off the Canary islands (detected between 1993 and 2016). Red color presents trajectories of anticyclone while the blue stands for cyclones.

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