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# Generation of coastal mesoscale anticyclonic eddies in the Gulf of Lion (NW Mediterranean)

Anne A. Petrenko, Ziyuan H. Hu, Andrea M. Doglioli, and Ivan Dekeyser

Aix-Marseille Université; CNRS; IRD; LOPB-UMR 6535, Laboratoire d'Océanographie Physique et Biogéochimique, OSU/Centre d'Océanologie de Marseille, France

In the framework of the LATEX (LAgrangian Transport EXperiment) project, the generation of coastal anticyclonic eddies is studied with the analysis of 8-year (2001-2008) time series of winds and 3D realistic modeled hydrology and circulation in the Gulf of Lion (North-Western Mediterranean). Numerical results show the presence of 8 long-life (lasting more than 15 days) eddies and several transient eddies (lasting less than 15 days) ones. Eddies are generated through a process that combines i) the local topography, characterized by a curvilinear shape and the presence of a cape, ii) strong channeled wind forcing, and associated Ekman transport and iii) stratification, strongest in the summer period. The generation process starts with a coastal upwelling, followed by the development of a sea surface height gradient due to the Ekman transport of the upwelled surface waters. This pressure gradient enhanced by the local topography induces a coastal jet along the curved coast from the higher sea surface region to the lower one. When the wind lasts enough, an anticyclonic loop gets created; and, coupled with a strong stratification, a long-life eddy can occur.
These long-life eddies only occur during the stratified period between July and the beginning of October; with the strongest probability of presence in August. The eddies are baroclinic structures extending throughout the mixed layer depth, often elliptic in shape and about 20-80 km in diameter. These anticyclonic eddies generally consist of warm, less salty buoyant water with a positive sea-surface height anomaly comparing to ambient waters. They can be reinforced or destroyed by the interaction with the large scale circulation along the continental slope.
During 2001-2008, two years differ from the others due to the absence of long life eddies. In 2004, due to a weak stratification, only transient eddies were observed. While in 2007, due to numerous persistent strong winds and a very strong stratification, an anticyclonic gyre covering nearly half the continental shelf settles down.
The numerical results are discussed in comparison with in situ observations collected during three LATEX cruises performed in 2008, 2009, 2010, and confirming the above generation mechanism.