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Influence of (sub)mesoscale anticyclones on the coastal biogeochemical processes in the western part of the Gulf of Lion (NW Mediterranean)

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The Gulf of Lion (GoL) extends from Toulon to the French-Spanish border in the North-Western Mediterranean. The basin is occupied by a large continental shelf, and includes the delta of the Rhône river, which represents the largest fresh water and nutrient source of the region. The coastline is one of the most densely populated areas of the whole Mediterranean basin. Due to the several human activities which are dependent on the ecological conditions and the water quality of the basin, environmental management is crucial. Biogeochemical characteristics of coastal regions are heavily influenced by cross-shelf exchanges, therefore understanding these processes is a key aspect. In the GoL exchanges between the coastal zone and the northwestern Mediterranean open waters are limited by the presence of the Northern Current (NC) which flows along the continental slope delimiting the basin.

The LAgrangian Transport EXperiment (LATEX, 2008-2011) was designed to study the mechanism of formation of anticyclones in the western part of the GoL, and their influence on the cross-shelf exchanges. Field observations along with numerical simulation results, showed that large ($\sim$ 20 km radius), persistent (up to 60 days) anticyclones can be generated by strong wind events under stratified water column conditions. The horizontal transport and mixing associated with these features have a profound impact on the ecological communities, as evidenced by the signature in surface chlorophyll concentration associated with the eddies often visible in satellite imagery. These structures can potentially be influenced by the Rhône river plume, and they can interact with the NC. In the later stages of their life time a portion of the eddy can get entrained within the NC and transported out of the GoL. Therefore, these anticyclonic eddies play an important role in regulating cross-shelf transport, and, thus, the biogeochemical characterisics of the coastal region.

Lagrangian methods are emerging as powerful tools for the analysis of transport properties in the oceans. In particular Lagrangian Coherent Structures (LCSs) derived from satellite altimetry have shown a good correlation with many advected tracers in open ocean. During the Latex10 campaign (September 1-24, 2010) we attempted a mapping of coastal LCSs with an adaptive strategy that combined satellite data, ship-based Acoustic Doppler Current Profiler (ADCP) measurements, and iterative Lagrangian drifter releases. This strategy allowed to successfully localize and track the LCSs present in the region for about 12 days from September 12 to 24. The *in-situ* observed LCSs confirmed that satellite derived LCSs are not as accurate in coastal regions, due to the limitations of altimetry data closer to the coast. Improvements on altimetry measurements in the coastal zone, will be crucial to allow reliable analysis on the influence of anticyclones on the coastal biogeochemical processes in the GoL from satellite derived LCSs.