COASTAL CIRCULATION IN THE GULF OF LION, THE INFLUENCE OF MESOSCALE PROCESSES ON INTERREGIONAL EXCHANGES.

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Abstract
The coastal circulation of the Gulf of Lion has been studied over a ten year period with *in situ*, remote sensing and numerical data. Intrusions, eddies, transient structures and frontal jets can strongly influence water fluxes in and out of the gulf. Transport fluxes as well as horizontal and vertical diffusivities are being assessed with data from varions *in situ* platforms. All these results bring new understanding on the influence of mesoscale processes on cross-shelf and interregional exchanges.

Keywords: Circulation experiments, Circulation models, Coastal processes, Gulf of Lyon, Mesoscale phenomena

The circulation of the Gulf of Lion (GoL), northwestern Mediterranean Sea, is complex and highly variable [1]. It is strongly influenced by the Northern Current, generally considered to constitute a dynamical barrier along the shelf. Exchanges between the GoL and offshore waters are thought to be induced by processes associated with the Northern Current [2,3]. This paper focuses on mesoscale processes at the eastern and western sides of the GoL.

The coastal circulation of the GoL has been studied over a ten year period with *in situ*, remote sensing and numerical data. The present study includes *in situ* data acquired during SARHYGOL (2000-2001), GOLTS (2002-2005) and LATEX (2007-2011). A realistic 3D numerical model Symphonie is run from 2001 to 2010 at high resolution (1 km) [4].

On the eastern side of the gulf, during specific conditions, a vein of the Northern Current (up to 1/3 of its measured flux) can intrude on the shelf. On the western side, wind conditions can affect whether the current enters or exits the gulf [5]. During stratified summer conditions, elliptical, shallow, anticyclonic eddies are observed north of Cape Creus [6,7], following northwestern wind events [8]. Two different generation processes can create them [9,7]. Generally eddies are associated with water retention; but transient structures can also detach from them and rapidly exit the gulf [7].

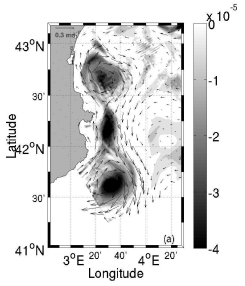

Fig. 1. Modeled relative vorticity [s^{-1}] and current velocity field at 20 m depth on September 3, 2010. From north to south: eddy in the western part of the Gulf of Lion, transient structure, eddy in the Catalan basin.

During the LATEX 2010 cruise, Lagrangian Coherent Structures derived from in situ data exhibit a frontal jet by which coastal waters escape from the GoL [10]. Transport fluxes are assessed, as well as horizontal diffusivities, using two approaches: i) combining stirring rates estimated from Lagrangian drifters with surface temperature gradients; ii) mapping a passive tracer's dispersion.

These mesocale processes (intrusions, eddies, transient structures, fronts) have an influence on interregional exchanges that can have strong impacts on biogeochemical and biological systems.

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