Contribution of the Rhone River water discharges to the dynamics of the Gulf of Lions in Autumn 1986

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The Gulf of Lions (NW Mediterranean) was covered by two oceanographic surveys, Pelagolion I and II, at the end of summer and at the end of autumn 1986. The main objective was to understand the role of the Rhone river water discharges on the pelagic production in that region at different seasons. Every cruise consisted on a series of CTD+Rossette casts scattered in the Gulf with a very fine survey in the vicinity of the river mouth. In this presentation, the results derived from CTD casts are summarized and discussed.

The main feature observed in the geostrophic velocity fields, obtained in both cruises (fig. 1), is the presence of the Liguro-Provençal-Catalan current contouring the shelf break, from east to west, with a maximum speed of about 35 cm/s, 15 miles south of Toulon (6°E) at the entrance to the region. This main current is present at all levels. Part of the water entering is deflected towards the river mouth along the north coast and another part flows to the south, mainly in summer, forming a cyclonic eddy. The main flow is minimum in the central part of the Gulf and it is enhanced again at the exit, directed towards the south 15 miles east of Cap Creus (42°20'N)

The main result concerning the dynamics is an anticyclonic eddy found in both cruises, in the nortwest quadrant of the Gulf, centered on (43°N 3°30'E). River discharges produce a thin low salinity surface layer spreading over the vicinity of the river mouth. This water is trapped by the eddy and reconducted towards the coast allowing a long residence time and mixing. By this process, the initial thin surface layer of low salinity near the river mouth is converted to an homogeneous body of dilluted water exposed to the local weather events in the coastal zone. This area acts as a reserve of the characteristic water type of the Gulf, one of the most important waters of continental influence present in the Western Mediterranean. For example, this reserve of dilluted water, after strong cooling in central winter, and spreading through the bottom of the shelf break, as described by Fieux (1974) may be one of the sources of the subsurface salinity minimum found along the Catalan coast (Salat & Font, 1987).

At the beginning of summer, Allain (1960) found traces of such structures allowing the recirculation of the dilluted water towards the coast. Therefore, by that season, the river runoff is usually much higher and the mixing layer above the thermocline is thinner than in autumn which allow a major spreading of surface low salinity layer as found by Castellón et al. (1985) in late spring. The summer observations of Millot (1981) show also an anticyclonic circulation in this area with local coastal upwelling events and downwelling in the center.

On the offshore side of the main current appears another anticyclonic eddy centered on (42°10'N 4°20'E) which seems to be very persistent. This eddy is completely uncoupled with the rest and the water in this region is not affected at all by the continental influence. Probably this eddy will play a major role on the deep water formation process during winter.

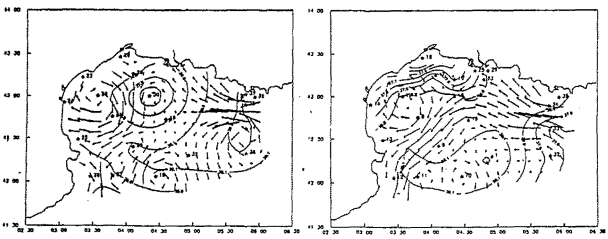

Figure 1. Geostrophic current and salinity fields at 10 m depth.
a) at the end of summer 1986 b) at the end of autumn 1986

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