Some mesoscale features in the Algerian Basin

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Scarce and compiled data, over several decades, do not account for the powerful mesoscale phenomena which drive the circulation in the Algerian Basin, that has led, in the past, to some misleading analysis of the water mass circulation in this region. These historical schemas have been reconsidered by means of hydrological and remote sensing observations, emphasizing the role of these mesoscale phenomena on the distribution of the various water masses in the Algerian Basin (MILLOT, 1987-a).

Indeed, the Médiprod-5 experiment. mainly based on one-month cruise hydrological data, surface buoy trajectories and 9 month-duration current meter observations at various locations and depths (100. 300, 1000 and occasionally 2000 m) has clearly pointed out the strength of the mesoscale activity and the role it plays in the distribution of the various parameters at sea (MILLOT, 1987-b, BENZOHRA and MILLOT, 1992-a,b). In MILLOT *et al.* (1992-c) we have clearly shown that such mesoscale phenomena are generated by the baroclinic instabilities of the Algerian Current. In the following we describe two such mesoscale phenomena; the first one (eddy O) by means of hydrological data and buoy trajectories, and the second one (event E) by means of SST signatures and current meter observations.

Eddy O has been sampled along a transect perpendicular to the coast at 4°40'E. and has its center at ≈150 km off the coast, with a diameter of ≈120-140 km, depressing the isolines by ≈150-250 m. Inside it, we have identified the major water masses one encounters in the western Mediterranean: the MAW which appears mainly as streamers at the surface, the WIW and the LIW, at mid-depth, which are the less mixed in the region. This accounts for the fact that such waters have been incorporated by complex entrainement processes from the area where they are usually found (the Algerian coast, the northern basin and the Sardinian slope, respectively for MAW, WIW and LIW). A striking feature the O-S diagrams have revealed, below the seasonnal thermocline, is the presence of a nearly homothermal lens of cooled MAW, ≈50 km in diameter, extending to a depth of 200 m. It is completely isolated from the surrounding waters and stands between the maxima of the current which extend at depth. We have concluded that such a lens of water means that the eddy has experienced at least one winter, estimating eddy O is several month old at least.

Dynamically, eddy O interacts with the Algerian Current, deflecting at least all the MAW layer seawards from its eastwards course towards the Sardinian Channel. The dynamical topography at 300 db (the level where LIW is usually found) shows complex interactions where onoffshore exchanges seem to occur. This leads to the enhancement of the characteristics of older LIW, we have previously hypothesized to flow eastwards along the Algerian slope, by mixing with the more recent LIW which is found mainly offshore.

The computation of the integrated available potential and kinetic energies leads us to think that eddy O is not in decaying process, and the radial distribution of these quantities shows clearly that it stores its energy from the Algerian Current.

We have been lucky to follow the growth and the eastward drift of an instability (named event E) during the Médiprod-5 experiment. It mainly consists in a meander of the Algerian Current of ≈100 km in through, enclosing a superficial anticyclonic eddy of 70-80 km in diameter, well evidenced by satellite images, and soon generating in the whole deeper layer an intense anticyclonic eddy having a diameter of ≥150 km in width, propagating eastwards along the Algerian continental slope at ≈3 km/day. Continuing its eastwards course, such a structure might become detached from the Algerian coast, becoming an open sea eddy as eddy O.

These two examples have given us the opportunity to set forth the role of the mesoscale phenomena in the distribution and circulation of the water masses in the Algerian Basin. The origin of such phenomena appears to be related to the growth of the Algerian Current instabilities via conversion of available potential energy into kinetic energy as it appears from our measurements and results inferred from numerical and physical models (CHABERT D'HIERES *et al.*, 1991; MORTIER, 1992).

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Upper layer circulation of the Marmara Sea

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The upper layer circulation of the Sea of Marmara during periods of high and low fluxes from the Black Sea (during October 1991 and March 1992) was determined from a combination of velocity and hydrographic data. Velocity data were obtained with a 150 Khz vessel-mounted Acoustic Doppler Current Profiler (ADCP) on board the R/V Bilim. ADCP measurements were carried out at fixed oceanographic stations and during cruising.

During the period of high discharge (March 1992), northerly winds were dominant, and the surface currents were mainly directed southward along the Anatolian coast. At exit into the Sea of Marmara from the Bosphorus, current velocities reached 300 cm/s and were on the order of 20 cm/s elsewhere in the anticyclonic circulation of the Sea of Marmara.

The upper layer flow exiting from the Bosphorus was not well defined during the low discharge period of October 1991. The exit flow was initially attached to the western side and followed the Thracian coast, while the basin general circulation was anticyclonic.