O-V2

Circulation and mesoscale phenomena in the Algerian Basin

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The Mediprod 5 experiment was carried out in 1986-1987 in order to investigate the Algerian Basin's dynamics between 0° and 5°E in the light of new hypotheses (Millot, 1985, 1987-a,b). This experiment was mainly based on a one-month campaign (June 1986) during which were collected ≈100 CTD casts (0-800m) and on current-meters set in place on 8 moorings at depths of 100m, 300m, 1000m and sometimes 2000m for a 9-month duration.

All the θ-S diagrams display the classical Mediterranean θ-S form. We have focused our attention on the Mediterranean Winter Water (MWW, formed in the north-western Mediterranean Sea and characterized by a θ minimum) and on the Levantine Intermediate Water (LIW, formed in the Eastern Mediterranean Sea and characterized by relative maxima of θ and S). It is first interesting to note that, in agreement with previous authors, relatively low θ_{min} of 12.63-12.70°C were encountered in the western Algerian Basin; it is also in that specific region that we have found the overall (with respect to nearly the whole southern part of the Western Mediterranean) lowest values of θ_{max} (≈13.06°C) and S_{max} (≈38.47), while the highest values of θ_{max} (≈13.45°C) and S_{max} (≈38.57) we have encountered were within an offshore eddy (Millot, 1987-b).

As most of the CTD casts were distributed along and across sections in a ≈80km coastal zone, we have estimated mean across and alongshore gradients of θ_{min}, θ_{max} and S_{max} and of their associated immersions; to seaward, θmax and Smax increase and θmin does not change, while all these parameters increase significantly eastwards. During the June campaign and during the 9-month experiment as well, the averaged currents at all depths and all locations were directed eastwards. The hydrological data analizes with the core method and the dynamical observations are coherent, thus leading us to refine our circulation schemes.

The first point is that both MWW and LIW, which flow southwards along the eastern Spanish coasts, are probably entrained from Spain towards Algeria coasts by the flow of Modified Atlantic Water (MAW). Then, MWW and LIW flow eastwards in the Algerian coastal zone and interact with the surrounding water masses; during this path, the coastal and well-mixed (it rounded along all the southern European coasts) LIW interacts with the offshore and less-mixed LIW probably entrained from Sardinia towards the interior of the basin by mesoscale eddies. Therefore, the θ_{max} and S_{max} in the Algerian coastal zone increase eastwards while LIW flows eastwards.

Basic statistics, empirical orthogonal functions (EOF) and spectral analyses performed on the 9-month time series support the distinction between a coastal and an offshore zones we have made in the previous papers. Even if all the averaged currents are directed eastwards, the vertical structure of the mesoscale phenomena down to ≈2000m is complex in the coastal zone and quite similar offshore. It stands out from vertical complex correlations that the upper layers in both zones are roughly disconnected from the deeper ones; this result is supported by EOF because only one surface-intensified mode accounts for more than 95% of total variance.

At 100m and from West to East in the coastal zone, the averaged currents decrease while variance ellipses show broad fluctuations slightly increasing, thus probably showing that energy transfer occurs from the mean towards the fluctuations. This result is consistent with satellite and *in situ* observations of eddies growing while propagating eastwards.

Significant (99%) horizontal correlation between two records (mean currents of ≈1km/day) collected at ≈1000m and ≈10 km apart, gives a mean phase speed of ≈5km/day. This value is supported by those inferred from spectral analysis (3-7 km/day in a 20-30 day band). This is also the value already deduced from i) the analysis of all the available infrared imagery and ii) our current measurements displaying a powerful anticyclonic mesoscale eddy propagated from ≈0° (early July 1986) to 5°E (late November 1986).

Millot C., 1985: Some feature of the Algerian Current. J. Geophys. Res., 90, C4, 7169-7176.

Millot C., 1987a: Circulation in Western Mediterranean Sea. Oceanol. Acta, 10, 2, 143-149.

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O-V3

Circulation in the Sporades Basin and Thermaikos Shelf (NW Aegean Sea) during the ECOAEGAIO-I Experiment

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Recent quasi-synpotic hydrographic data collection, carried out during the ECOAEGAIO-I cruise (June 1987), allowed the study of the spring circulation in the Sporades Basin and on the Thermaikos Shelf (Fig. 1).

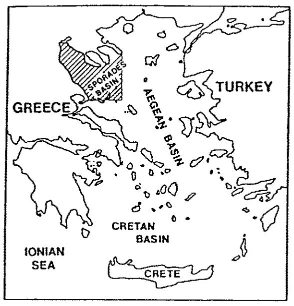

Fig. 1 The investigation area (shaded)

Shallow dynamic topography (Fig. 2a) shows the renewing of surface water. The surface circulation is globally anticlockwise throughout the study area. Intrusion of Aegean Sea water, from offshore, appears along the northern coastline of the basin. Part of this water penetrates the shelf, while the rest flows southwestward along the slope. The current on the shelf is dominantly northeastward, and appears as a meandering flow directed by small eddies. Outflow of lower salinity waters, originating from large river inputs, takes place along the western coastline.

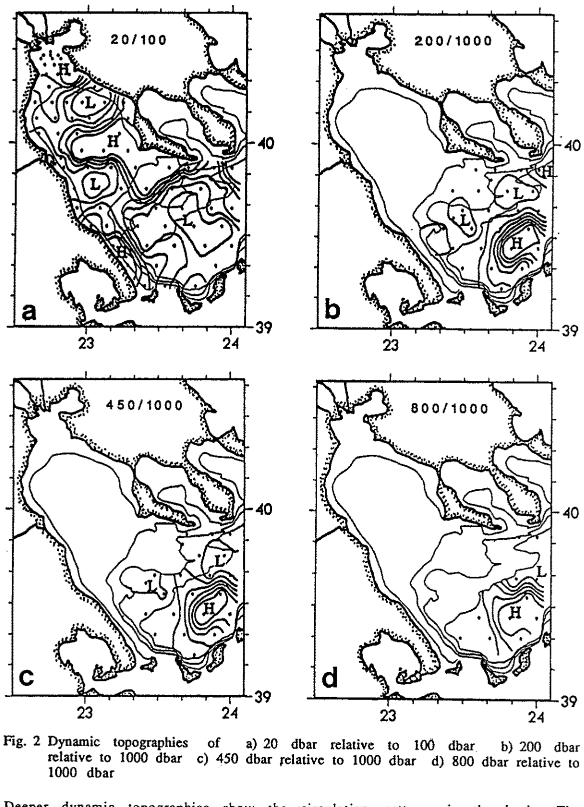

Fig. 2 Dynamic topographies of a) 20 dbar relative to 100 dbar b) 200 dbar relative to 1000 dbar c) 450 dbar relative to 1000 dbar d) 800 dbar relative to 1000 dbar

Deeper dynamic topographies show the circulation patterns in the basin. The shelfbreak depth map (Fig. 2b) depict a sharply defined clockwise eddy in the southwestern part of the basin. This gyre is roughly delineated by the 800 m isobath and remains clearly identifiable down to deeper levels (Fig. 2c and d). Two anticlockwise cells appear between the slope and the main eddy (Fig.2c and d). These secondary cells are nestled in the canyon valleys, formed by the broad open slope that practically separates the basin in two parts. The circulation features in the basin are found to be composed of different water masses and are persistent with increasing depth. Furthermore, they are believed to be constrained and generated by the bottom topography.

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