Hydrography and circulation of the Ionian Sea (1988-1991)

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CTD data collected during the POEM cruises carried out from 1988 to 1991 were submitted to objective analysis for an optimal estimation of the Ionian Sea hydrography and circulation. The distribution of the main water masses in the area (Atlantic Water, Levantine Intermediate Water and Adriatic Deep Water) was examined in relation to the sub-basin circulation features and to different seasons. Horizontal and vertical structure of the analysed fields has revealed a population of anticyclonic and cyclonic eddies interconnected by meandering jets and currents in the upper thermocline. Dynamic processes were generally weaker in the lower layers. Significant variabilities in the principal modes of circulation were however evidenced and are here discussed.

Numerical modelling of the Mesoscale activity and the deep mean flow generation in the Algerian Current

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Algerian eddies are of primary importance to the circulation of all the water masses in the western Mediterranean. Analytical models suitable for stability analysis show the primary importance of baroclinic instability of the Algerian current in determining the caracteristic of these eddies. A numerical modelling of the generation of an eddy is presented using the LODYC 3DPE model in a periodic channel.

Using the same numerical model, these eddies are shown to generate a deep mean flow. The flow appears as a system of two meandering jets: a jet flowing westward near the coast and an offshore jet flowing eastward, both having an enhanced barotropic componant. It is shown that this system is barotropically unstable at longer wavelength than the most baroclinically unstable wave of the initial instability. This instability process generates an eastward coastal surface and deep mean flow. In most cases, during this reversing of two jets system, the surface coastal anticyclones split, creating anticyclones offshore.

Cascade of energy toward larger scale is shown to be a process able to generate larger anticyclones offshore, through successive merging of small coastal anticyclones or small offshore anticyclones previously generated by splitting. This cascade is inhibited by the planetary vorticity gradient. Nevertheless, in this case, large anticyclones are directly created offshore by the meandering of the new mean flow generated at the coast after the barotropic instability.

The introduction of a schematic summer thermocline lowers the available potential of the system: the flow in unstable at smaller wavelengths and the surface and deep mean flow created are much weaker. Nevertheless, offshore anticyclones are still generated through similar processes.

Accurate comparisons with in-situ measurements and remote sensed images, prove that these processes account for most of the observed caracteristics of the circulation in the Algerian Basin.

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