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TEMPO Experiment : Characteristics of the circulation in the Northern Tyrrhenian Sea

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The Tyrrhenian circulation is largely cyclonic, with very weak currents organized in two main structures bordering at about 40° North of latitude. The early observations (e. g. Krivosheya and Ovchinnichov (1973) and Moen (1984)) indicate that, whereas the wind can be considered responsible for the basin-wide circulation, the wind blowing from the Bonifacio Strait is the principal source of energy for the cyclonic structure in the north.

In order to evaluate the characteristics of the circulation in this part of the basin, an experimental program involving annual current measurements at different places together with periodic hydrographic campaigns and drifting buoys, has been carried out from September 1989 as a part of the international project TEMPO (Tyrrhenian Eddy Multi-Platform Observation Experiment). The purpose of this project is the investigation of the Tyrrhenian circulation by an integrated use of different data collected from different platforms (satellite, aircraft and ship). In the following a preliminary description will be given of the conditions existing in the fall season with a particular focus on the vertical structure of the water column and the circulation pattern at various depths.

The extension of the mixed layer varies from 20m in the central area to 45m in the southern part of it, just underlined by a well developed thermocline. The surface layer of Modified Atlantic Water (MAW) has its core (pointed out by a minimum in salinity) at about 50m of depth, nearly uniform all over the area, while the core of the Levantine Intermediate Water (LIW) is at 350-400m of depth and has the highest values in the southernmost part of the basin.

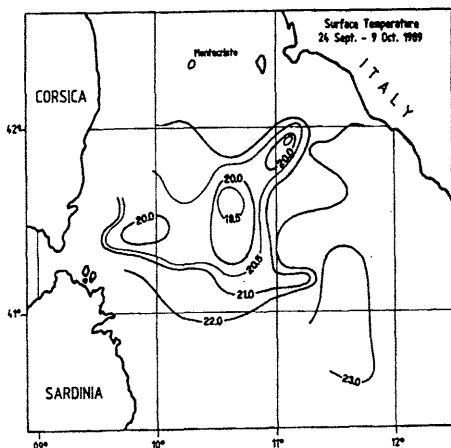
The horizontal distribution of the surface temperature shows that the lower temperatures are found in the central basin. Close to the 41° parallel a marked frontal structure develops in the surface layer (MAW), dividing the colder water in the north from that warmer in the south. In the intermediate and deep layers the temperature and salinity values decrease progressively along a southeast-northwest direction, having the highest gradients near the 41th parallel. The density distribution at all depths is consistent with a cyclonic circulation of the water mass involving most of the water column.

The current measurements at all the observed depths (50, 150 and 350m) show a cyclonic pattern with very low mean values (3cm/s or less), the highest values being recorded near the boundary frontal system.

The computation of the surface dynamic depths starting from a reference level of 350m, indicates the presence of a cyclonic gyre having the same velocity values as those directly observed.

Finally the trajectory of the surface drifting buoy released near the frontal signature shown in the horizontal temperature distribution, fully supports the indication that the area is affected by a cyclonic circulation, that is stationary for the considered period.

In conclusion all the measurements indicate that a cyclonic circulation having a very low dynamics prevails in the northern Tyrrhenian basin. From the surface signature of this structure, easily detectable in the thermal maps of the area, important indications can be obtained for the comprehension of the structure below.



REFERENCES

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