

On eddies formation in the Northwestern part of the Main Black Sea Current

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The investigations of the different scales eddies are of considerable importance in modern oceanography. It is due to the important role which they play in oceanic processes. According to recent data the eddies formation in the region of the Main Black Sea Current (MBSC) by its meandering is a remarkable feature of the Black Sea circulation. Analysis of a large set of hydrographic data has identified the regions with intensive meandering of MBSC, which have the largest probability of eddies formation. One such region is the part of MBSC over the continental slope of the northwestern part of the Black Sea. It is known that there is a quasi-stationary anticyclonic eddy in this region. This eddy can be seen on AVHRR-IR images.

This paper describes the thermo-haline structure of the anticyclonic eddy and its main parameters in detail, based on data from three hydrographic surveys in the northwestern part of the Black Sea (October-December, 1987). The distance between the hydrographic stations was 20' at the latitude and 30' at the longitude. The time interval between the surveys was approximately one month. All dynamic computations were based on a common reference level of 300 m.

The anticyclonic eddy was observed in the first and the third surveys; it was not observed in the second survey. Data of most interest were obtained in the third survey. These are described below.

On the dynamical topography map the stream of MBSC and the large anticyclonic eddy (AED), extending approximately 50 n miles at the longitude and 30 n miles at the latitude, are seen clearly. Geostrophic velocities of MBSC are upto 38 cm/sec and those of the AE upto 30 cm/sec. The stream of MBSC was displaced to the south. The AE penetrated from the surface to a depth of 300 m.

The sinking of the water inside the AE was considerable. The depth of the 8°C isotherm at the center of the AE was 170 m, and 90 m at the periphery. The depth of the 21 ppt isohaline was 190 m at the center and 100 m at the periphery, while the corresponding depths of the 16 sigma-t isopycnal were 170 m and 80 m respectively.

The difference between the temperatures at the center of the AE and its periphery changed sign with depth, due to the existence of the Cold Intermediate Water Layer (CIWL). Therefore the same eddy had both a warm core and a cold core, depending on the depth.

In our case the temperature was higher from the surface to a depth of 70 m at the center of the eddy than at the periphery. From 70 m to 300 m (depth of AE penetration) the temperature was lower in the center than at the periphery. The lens of the coldest water with temperature less than 6.5°C was found at the layer 80 - 110 m at the center of the AE.

Our observations show that the AE does not exist continuously in this region of the Black Sea.

The mechanism, the conditions of generation and development of anticyclonic eddies are the subjects of future investigations. However, it is clear that the meandering stream of MBSC is the main cause of the generation of these eddies. Possibly, the meridional displacement of the MBSC plays an important role. The stream, moving across the continental slope, is situated sometimes in the shallow waters and sometimes in the deep waters. The maximum of the AE development will be at the deep waters, when the MBSC stream is situated at its southern-most location, and the minimum of AE development will be at the shallow waters, when the stream is situated at its northern-most position. In the latter case the AE may vanish.

The result of our present investigation is in agreement with earlier observations of the existence of the quasi-stationary AE in the continental slope region of the Black Sea north-western part.

REFERENCES

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