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Numerical study of the turbulent characteristics of cyclonic and anticyclonic vortical structures in the Black Sea

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For typical conditions of wind regime over the Black Sea by using of the original 3D baroclinic numerical model of dynamics fields of current, temperature and salinity were computed. It is shown that the changeability of current system with depth in the Black Sea has steepness structure. It means that all depth of the basin may be considered as consisting of some homogeneous sub-layers which undergoes some changes in time.

The calculations show that during about one day, as a result of action of the January atmospheric cyclonic wind, in the eastern part of the Black Sea cyclonic and anticyclonic vortex system is formed. These eddies represent Taylor-Proudman potential vortexes having steady vertical cylindrical configuration and allocated in the homogeneous sub-layer within depth of 606-906 m.

The vortex characteristics for both cyclonic and anticyclonic vortexes are given in figures: the distribution of the velocity, temperature, salinity and horizontal turbulent viscosity in the vortex against the distance from the center of the vortex along the parallel and meridian, respectively; vertical distribution of the temperature gradient, salinity stratification, Brunt-Väisälä frequency, and Richardson number.

Analysis shows that the vortex pillars, arranged in the homogeneous sub-layers, change their size and form in space and time. With increasing of depth all turbulent

characteristics of these vortexes slightly change in the time.