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Evolution of a turbulent pycnocline within the framework of a modified model of turbulent closure

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The formation and evolution of a turbulent pycnocline generated by internal wave breaking were investigated within the framework of a modified model of turbulent closure. Numerical computation based on closed Reynolds equations using closure hypotheses obtained in the framework of the kinetic approach showed a strong dependence of vertical distributions corresponding to hydrodynamic parameters on the anisotropy of turbulence and speed of pycnocline motion. Strongly anisotropic motion is characterized by the presence of stepwise variations in the vertical profiles of buoyancy frequency, turbulence scale, and kinetic and potential energy as compared to the known analytical solution obtained earlier without allowance for a non-steady-state term in the kinetic energy balance equation. In the case of a weaker anisotropy, no sharp changes are observed in spatial and energy characteristics of turbulence and the qualitative shape of their profiles in the pycnolcline region coincides with the known analytical dependences. The obtained result is important for development of numerical climatic models of the interaction between the atmosphere and the ocean.
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