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DNS of unsteady, turbulent convection in a rotating stratified fluid. ANIKESH PAL, Oak Ridge National Laboratory, VAMSI CHALMALLA, University Of North Carolina, Chapel Hill — Turbulent convection under the influence of intense surface cooling and earth's rotation is a common phenomenon observed in the ocean. In the present study, direct numerical simulations are performed to understand this dynamics. The effect of rotation is represented by Rossby number Ro^* which is defined in terms of ocean depth H, Coriolis parameter f and surface buoyancy flux B_0, as $Ro^* = \frac{B_0^{1/2}}{Hf^{3/2}}$. Cooling at the surface results in the formation of unstable density configuration where denser fluid lies on top of the lighter fluid. These unstable density configuration leads to a turbulent front. When the turbulent front reaches a transition depth z_c, it experiences the effect of rotation leading to the formation of quasi- 2D vortices beneath the 3D turbulent layer. If the surface cooling is strong enough, these vortices penetrate further downwards producing vortex columns. Qualitatively, DNS results agree well with the findings of experimental study by Maxworthy & Narimousa(1993). The motivation of this study is to understand the nonlinear dynamics and turbulence scaling as the surface cooling and Coriolis parameter are varied.

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