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Energetic dynamics of a rotating horizontal convection model of an ocean basin with wind forcing[1] VARVARA ZEMSKOVA, BRIAN WHITE, ALBERTO SCOTTI, University of North Carolina at Chapel Hill — We analyze the energetic dynamics in a rotating horizontal convection model, where flow is driven by a differential buoyancy forcing along a horizontal surface. This model is used to quantify the influence of surface heating and cooling and surface wind stress on the Meridional Overturning Circulation. We study a model of the Southern Ocean in a rectangular basin with surface cooling on one end (the South pole) and surface warming on the other end (mid-latitudes). Free-slip boundary conditions are imposed in the closed box, while zonally periodic boundary conditions are enforced in the reentrant channel. Wind stress and differential buoyancy forcing are applied at the top boundary. The problem is solved numerically using a 3D DNS model based on a finite-volume AMR solver [Santilli and Scotti, J. Comp. Phys, 2015] for the Boussinesq Navier-Stokes equations with rotation. The overall dynamics, including large-scale overturning, baroclinic eddying, turbulent mixing, and resulting energy cascades are investigated using the local Available Potential Energy framework introduced in [Scotti and White, J. Fluid Mech., 2014]. We study the relative contributions of surface buoyancy and wind forcing along with the effects of bottom topography to the energetic balance of this dynamic model.

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