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Large-scale barotropic circulation in rotating convection ANTONIO RUBIO, KEITH JULIEN, University of Colorado Boulder, IAN GROOMS, New York University — High resolution DNS for rotating Rayleigh-Benard convection using the non-hydrostatic balanced geostrophic equations (NHBGE) (Julien et al 1998, 2006) was carried out in the geostrophic turbulence regime, revealing the existence of a slow-growing large scale barotropic mode. Such large scale modes have been previously observed as an inverse cascade in stable layer quasi-geostophic dynamics or via instability mechanisms of thermal Rossby waves occuring in presence of sloping endwalls (i.e quasi-geostrophic beta-convection). In this talk we report on a natural large scale organization resulting from smaller scale geostrophic thermal turbulence in an unstably stratified layer. This large scale circulation is discussed in detail in terms of spectra of the term-by-term balances of the baroclinic and barotropic vorticity equations of the NHBGE. Specifically, simulations studies reveal a tendency for the kinetic energy spectrum to follow a -3 scaling exponent at large horizontal scales and a -5/3 exponent in an inertial range of (horizontally) homogenous turbulence occuring at scales smaller than the convective forcing.

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