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Energy spectra of stably stratified turbulence YOSHIFUMI KIMURA, Nagoya Univ., JACKSON HERRING, NCAR — We investigate energy spectra of stably stratified turbulence using direct numerical simulations (DNS) at a resolution of 1024^3. The calculation is done by solving the 3D Navier-Stokes equations under the Boussinesq approximation pseudo-spectrally. Using toroidal-poloidal decomposition (Craya-Herring decomposition), the velocity field is decomposed into the vortex mode and the wave mode. In general, both the wave and vortex spectra are consistent with a Kolgomorov–like $k^{-5/3}$ range at sufficiently large k. At large scales, and for sufficiently strong stratification the wave spectrum is a steaper $k_\perp^{-2}$, while that for the vortex component is consistent with $k_\perp^{-3}$. Here $k_\perp$ is the horizontally gathered wave numbers. In contrast to the horizontal wave number spectra, the vertical wave number spectra show very different features. We can observe clear k_z^{-3} dependence for small scales while the large scales show rather flat spectra. We link these spectra to the 2nd order structure functions of the velocity correlations in the horizontal and vertical directions. Finally we study the inviscid limit in which the highest wave-numbers are progressively thermalized, leaving the smaller wave numbers to adjust to their internal dynamics *sans* dissipation. In this case, we see–for the non-thermalized components–similar dynamics as that for the finite Reynolds case.

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