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Energy transfer for stably stratified turbulence YOSHIFUMI KIMURA, Nagoya University, JACKSON HERRING, NCAR — To understand the mechanism of producing the power-law transition in the energy spectra for stably stratified turbulence, we investigate the energy transfer using direct numerical simulations (DNS) at a resolution of 1024^3. The calculation is done by solving the 3D Navier-Stokes equations with horizontal forcing under the Boussinesq approximation pseudo-spectrally. Using toroidal-poloidal decomposition (Craya-Herring decomposition), the velocity field is decomposed into vortex and wave modes. We have observed that the vortex and wave spectra are consistent with a Kolgomorov–like $k^{-5/3}$ range at sufficiently large k, and that at large scales, the wave spectrum is a steeper $k_\perp^{-2}$, while that for the vortex component is consistent with $k_\perp^{-3}$ for sufficiently strong stratification. Here $k_\perp$ is the horizontally gathered wave numbers. Therefore there is a power-law transition in the spectra of the both modes. By looking at the energy budget of the wave and vortex modes, we study the energy transfer functions. We will demonstrate that the energy transfer shows a difference from the conventional Kolmogorov picture for isotropic turbulence, in particular at the large scale behavior in which the energy transfer is balanced with enhanced dissipation presumably because of the rough layer edges suggested by Herring & Métais (1989).
Herring, J.R. & Métais, O. : Numerical experiments in forced stably stratified turbulence *J. Fluid Mech.* **202** 97–115 (1989).

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