Energy transfer in stably stratified turbulence

YOSHIFUMI KIMURA, Nagoya University, JACKSON HERRING, NCAR — Energy transfer in forced stable stratified turbulence is investigated using pseudo-spectral DNS of the Navier-Stokes equations under the Boussinesq approximation with 1024^3 grid points. Making use of the Craya-Herring decomposition, the velocity field is decomposed into vortex ($\Phi_1$) and wave ($\Phi_2$) modes. To understand the anisotropy of stably stratified turbulence, the energy fluxes in terms of the spherical, the horizontal and the vertical wave numbers, are investigated for the total kinetic, $\Phi_1$, $\Phi_2$ energies, respectively. Among the three fluxes, the spherical and the horizontal look similar for strong stratification, and $\Phi_1$ flux shows a wave number region of constant value, which implies Kolmogorov’s inertial range. The corresponding spectral power are, however, $k^{-5/2}$ for the spherical and $k^{-5/3}$ for the horizontal cases. In contrast to these, the vertical energy fluxes show completely different features. We have observed the saturation spectrum $E(k_z) \sim C N^2 k_z^{-3}$ for strong stratification as before[1], but the mechanism to produce this spectrum seems different from the Kolmogorov picture.