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Formation and destabilization of Kelvin-Helmholtz billows in stably stratified turbulence YOSHIFUMI KIMURA, Graduate School of Mathematics, Nagoya University, JACKSON HERRING, NCAR — We investigate the formation and destabilization of Kelvin-Helmholtz billows in stably stratified turbulence using the pseudo-spectral DNS of the Navier-Stokes equations under the Boussinesq approximation with 2048^3 grid points. Our method is to integrate the equations from the zero total energy initial condition with horizontal forcing imposed in a narrow wave number band. In the course of developments, the horizontal spectra first show a single steep power-law ($k^{?4,5}$, where k is the horizontal wavenumber), and then the tail part of the spectrum begins to rise to show the Kolmogorov-type slope ($k^{?5/3}$). From the viewpoint of vortex formation, we first observe that many wedge vortices are produced which move horizontally (like dipoles) in random directions. As time goes on, the wings of the wedges become thinner and thinner while translating, and finally detach to be almost independent vortex layers. This thinning mechanism makes the vertical shear stronger and eventually the local Richardson number small enough to produce Kelvin-Helmholtz billows. We will demonstrate that the transition in the horizontal energy spectra has a close relation with the destabilizing process of the Kelvin-Helmholtz billows.

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