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Statistics of energy transfer in the inertial subrange –Data analysis of high-resolution DNS of incompressible turbulence in a periodic box TAKASHI ISHIHARA, YUKIO KANEDA, Nagoya University — Statistics of energy transfer in the physical and wave vector space are studied by using a series of high-resolution direct numerical simulations (DNS) of incompressible turbulence in a periodic box. The number of grid points in the DNS and the Taylor micro-scale Reynolds number R_λ are up to 4096^3 and 1130, respectively. We used two kinds of filtering (S) a spectral cutoff filter and (G) a Gaussian filter to define the grid scale (GS) and sub-grid scale (SGS) components. The DNS data suggest (i) the pdf's of energy transfer from GS to SGS components in (G) are more asymmetric in a systematic manner about the most probable value than those in (S), (ii) spectral eddy viscosity in (G) is almost constant ($\approx 0.35\langle\epsilon\rangle^{1/3}k_c^{-4/3}$) for the wavenumber $k < 0.8k_c$ provided that the cutoff wavenumber k_c is in the inertial subrange, where $\langle\epsilon\rangle$ is the mean rate of energy dissipation per unit mass, and (iii) the volume ratio of the backscatter region in (G) scales well with $k_c\eta$ irrespectively of R_λ and is about 8% in the inertial subrange, where η is the Kolmogorov dissipation length.

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