Vortex Clusters and Their Time Evolution in High- Reynolds-Number Turbulence[1] TAKASHI ISHIHARA, Nagoya University, ATSUYA UNO, RIKEN AICS, KOJI MORISHITA, MITSUO YOKOKAWA, Kobe University, YUKIO KANEDA, Aichi Institute of Technology — Time series data (with a time interval of $4\tau_\eta$) obtained by high-resolution direct numerical simulations (DNSs) of forced incompressible turbulence in a periodic box, with a maximum of 12288^3 grid points and Taylor micro-scale Reynolds numbers R_λ up to 2300, are used to study the vortex dynamics in high Reynolds number (Re) turbulent flows. Here τ_η is the Kolmogorov time scale. A visualization method to handle such large-scale data was developed for this study. In the high Re turbulence generated by the DNS, we observed the dynamics of tube-like vortex clusters of various sizes, which are constructed by strong micro vortices. For example, we observed the generation of the tube-like clusters of various sizes and the processes of their merging and breakdown. We also observed layer-like vortex clusters of the order of the integral length scale forming shear layers in the high Re turbulence.

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