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Statistical properties for homogeneous isotropic turbulence and turbulent channel flows using a coherent structure function HIROMICHI KOBAYASHI, Keio University, YASUHIRO TOMINAGA, TAISUKE KUBOTA, MAMORU TANAHASHI, TOSHIO MIYAUCHI, Tokyo Institute of Technology —
Coherent structures in turbulence are usually extracted by the second invariant of a velocity gradient tensor. Coherent fine scale eddies can be scaled by the Kolmogorov microscale and the rms of the velocity fluctuation, and the scaling is universal in homogeneous isotropic turbulence, turbulent channel flows and turbulent mixing layers. On the other hand, a coherent structure function is defined as the second invariant normalized by the magnitude of the velocity gradient tensor. The coherent structure function F_{CS} extracts the statistical properties of turbulent flow fields, and has been successfully used to a local subgrid-scale model for complex geometries. Since the F_{CS} has distinct upper and lower limits, it may be convenient to use F_{CS} rather than the second invariant whose magnitude depends on Reynolds number. The statistical properties of F_{CS} are shown with outstanding DNS databases for homogeneous isotropic turbulence and turbulent channel flows.

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