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Intermittent dissipation field in multi-mode stretched-spiral vortex KIYOSI HORIUTI, TAKEHARU FUJISAWA, Dept. Mechano-Aerosp. Eng., Tokyo Institute of Technology, Japan — The property of the stretched spiral vortex (SSV) (Lundgren 1982) is studied using DNS data of homogeneous isotropic and shear turbulence and the entire process of its creation, growth and annihilation is revealed. SSV is composed of three modes of configurations regarding the alignment of the vorticity vectors on the tube in the core region of SSV and the spiral sheets which emanate from the core, and all three modes are indeed identified. It is shown that the differential rotation induced by the tube and that self-induced by the sheets causes the vortex sheets in the spiral to continually tighten. With the tightening of the spiral turns of the spiral sheets, the sheets are stretched to extreme length ($\leq 2\overline{\eta}$, where $\overline{\eta}$ is the averaged Kolmogorov length). Intense turbulent energy cascade and dissipation are caused associated with this stretching of the sheets in accordance with Lundgren (1982), while no appreciable dissipation is generated in the core region. As a result, the local dissipation rate ε and Kolmogorov length η exhibit strong intermittency. Therefore, the eduction of the dissipation field is critically dependent on the grid resolution (Schumacher, Sreenivasan & Yeung 2005), and the grids with at least 1024^3 or $k_{\max}\overline{\eta} \approx 4.0$ ($k_{\max}$ is the largest wavenumber) is indispensable for a precise capture of the spiral turns and dissipation field at $R_\lambda \approx 78.0$.

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