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On Dissipative Structures of Stirring-Grids Turbulence

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The spatiotemporal scalar and kinetic energy dissipation rates were measured in a stationary homogeneous turbulence generated by a pair of vertically stirring grids in a water tank using high-speed successive planar laser-induced fluorescence and particle image velocimetry techniques. Results reveal the complexity of the fine structures of both scalar and kinetic energy dissipation rate fields that contain line-like, blob-like, and sheet-like structures at which essentially all the dissipation is concentrated, a highly intermittent phenomenon. The diameter, size, and thickness of these fine structures are found ranging in scale from 0.4 to 5 Kolmogorov scale (LK) with a mean of about 1 LK and 3 LK for scalar and kinetic energy dissipative structures, respectively. These measurements are useful for understanding of some topological features of fine scale turbulence.

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