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Lagrangian statistics of turbulent dispersion from 8192^3 direct numerical simulation of isotropic turbulence[1] DHAWAL BUARIA, Georgia Tech and ENS Lyon, France, P.K. YEUNG, Georgia Tech, B.L. SAWFORD, Monash University, Australia — An efficient massively parallel algorithm has allowed us to obtain the trajectories of 300 million fluid particles in an 8192^3 simulation of isotropic turbulence at Taylor-scale Reynolds number 1300. Conditional single-particle statistics are used to investigate the effect of extreme events in dissipation and enstrophy on turbulent dispersion. The statistics of pairs and tetrads, both forward and backward in time, are obtained via post-processing of single-particle trajectories. For tetrads, since memory of shape is known to be short, we focus, for convenience, on samples which are initially regular, with all sides of comparable length. The statistics of tetrad size show similar behavior as the two-particle relative dispersion, i.e., stronger backward dispersion at intermediate times with larger backward Richardson constant. In contrast, the statistics of tetrad shape show more robust inertial range scaling, in both forward and backward frames. However, the distortion of shape is stronger for backward dispersion. Our results suggest that the Reynolds number reached in this work is sufficient to settle some long-standing questions concerning Lagrangian scale similarity.

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