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Multi-particle Lagrangian statistics of turbulent dispersion from simulations of isotropic turbulence at $R_\lambda \approx 1100$[1] J.F. HACKL, P.K. YEUNG, Georgia Institute of Technology, B.L. SAWFORD, Monash University — Numerical simulations at up to 4096^3 grid resolution have been conducted on machines with very large processor counts to obtain the statistics of Lagrangian particle pairs and tetrads in turbulent relative dispersion. Richardson-Obukhov scaling for mean-square pair separation adjusted for initial conditions is observed for intermediate initial separations, in support of prior estimates of about 0.6 for Richardson's constant. Simulations at $R_\lambda \approx 650$ have also been conducted for sufficient duration to obtain fully converged exit time statistics for independently moving particles at very large scales. The fact that all particle pairs reach such large scales of separation means the inertial subrange of exit times is also captured accurately. The results show Kolmogorov scaling for positive moments of exit time, but a strong dependence on initial separations for inverse moments. Inertial-range estimates of tetrad shape factors are reinforced by simulations at Taylor-scale Reynolds numbers up to about 1100. Tetrad shape parameters conditioned on cluster size are also examined in order to understand geometric features of turbulent dispersion in more detail.

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