Abstract Submitted
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Reynolds number dependnce of Lagrangian velocity, acceleration and dissipation statistics in large numerical simulations of isotropic turbulence[1] P.K. YEUNG, D.A. DONZIS, E.A. KURTH, Georgia Tech, S.B. POPE, Cornell Univ. — Recent experiments and numerical simulations have shown that the Lagrangian fluid particle acceleration is highly intermittent, and that higher Reynolds numbers are required to resolve issues of Kolmogorov similarity in the Lagrangian versus Eulerian frame of reference. We have made progress in direct numerical simulations (DNS) at grid resolution 2048^3 and Taylor-scale Reynolds number close to 700. The Lagrangian velocity structure function is found to approach Kolmogorov similarity, with the scaling constant (C_0) within 10-15% of an estimated asymptotic value in the literature. Analyses of Eulerian data show that the acceleration has a strong dependence on local relative motion involving straining and rotational effects. At higher Reynolds numbers the autocorrelation of energy dissipation is approximately exponential, with an integral time scale of several Kolmogorov time scales. Velocity and acceleration autocorrelations conditioned on dissipation, enstrophy or pseudo-dissipation are all indicative of more rapid changes for particles moving in regions of large velocity gradients. DNS at 2048^3 has helped isolate some previous observations as due to low-Reynolds-number effects.

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