Abstract Submitted
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Backward tracking and Lagrangian passive scalar mixing in turbulence simulations[1] D. BUARIA, P.K YEUNG, Georgia Tech, B.L. SAWFORD, Monash University, Australia — In many environmental problems the dispersion of contaminants with finite molecular diffusivity is closely related to the trajectories of molecules which undergo Brownian motion relative in the field. This invokes a Lagrangian view of mixing, which asks, for instance, how a pair of molecules far apart at earlier times may come together and cause a high local concentration of the diffusing material or property. We have implemented an efficient and statistically robust approach to extract backward statistics via the post-processing of trajectory data stored in direct numerical simulations with many millions of fluid particles and diffusing molecules. Results are obtained at Taylor scale Reynolds number 140 to 400 and Schmidt numbers from 0.001 to 1000. As expected the contrast between forward and backward dispersion is greater at higher Reynolds number where nonlinear turbulent transport is stronger. Subject to sampling, the Lagrangian data obtained agree well with Eulerian results on the production and dissipation of the variance of a passive scalar driven by a uniform mean gradient in isotropic turbulence. Extensions to multi-particle and multi-molecule clusters are also briefly addressed.

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