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Backward two-particle dispersion in turbulence: asymptotic behaviors at high Reynolds number[1] PUI-KUEN YEUNG, D. BUARIA, Georgia Tech, B.L. SAWFORD, Monash Univ, Australia — Backward relative dispersion of fluid elements and diffusing substances or property markers is central to a Lagrangian view of turbulent mixing, but data are not readily available. Recently we have devised a numerical approach based on massively parallel processing of the trajectories of many billions of particle pairs, and have used it to obtain results in simulations of stationary isotropic turbulence up to 4096 in size and Taylor-scale Reynolds number up to 1000, with a wide range of initial separations. Backward dispersion is faster than forward, especially at intermediate times after the ballistic range and before long-time diffusive behavior is reached. Richardson scaling is demonstrated for the mean-squared separation, with forward and backward Richardson constants estimated to be 0.55 and 1.5 respectively, which are close to or comparable to other estimates. However, because of persistent dissipation sub-range effects no corresponding scaling was observed for higher order moments. An effort is made to analyze theoretically several key characteristics such as asymmetry in time and exponential growth of third and fourth moments at early times. Related results for marked entities that diffuse relative to the fluid will also be briefly addressed.

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Pui-Kuen Yeung
Georgia Institute of Technology

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