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Backwards Two-Particle Dispersion in a Turbulent Flow[1]
THEODORE DRIVAS, Johns Hopkins University — We derive an exact equation governing two-particle backwards mean-squared dispersion for both deterministic and stochastic tracer particles in turbulent flows. For the deterministic trajectories, we probe consequences of our formula for short time and arrive at approximate expressions for the mean squared dispersion which involve second order structure functions of the velocity and acceleration fields. For the stochastic trajectories, we analytically calculate an exact t^3 contribution to the squared separation and additionally compute the average dispersion using direct numerical simulation (DNS) results of incompressible homogeneous isotropic turbulence. We find that this exactly calculable term accounts for almost all of the observed behavior. We argue that this contribution also appears to describe the asymptotic Richardson-like behavior for deterministic paths and present DNS results to support this claim.

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