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Backward tracking for the study of turbulent dispersion in direct numerical simulations over a range of Reynolds numbers[1] D. BUARIA, P.K. YEUNG, Georgia Tech, B.L. SAWFORD, Monash Univ., Australia — The dispersive character of turbulence is well known, and readily observed through, for example, the increase with time of the mean separation between fluid particle pairs in a Lagrangian framework. Usually, in both direct numerical simulations (DNS) and laboratory experiments, a population of fluid particles is tracked forward in time from specified initial conditions. However, from a modeling perspective, it is more important to track the particles backwards, which would help address questions about the dynamical origins of a patch of contaminant material, or a highly convoluted multi-particle cluster. In this talk we present numerical results on backward statistics obtained by sampling particle pairs of desired separation at the final time of a relatively long DNS run. The calculation essentially involves processing large datasets consisting of the complete time history of position, velocity and velocity gradients along the trajectories. Promising results on both forward and backward dispersion from up to 16 million particles have been obtained over time intervals spanning the ballistic, inertial, and diffusive ranges. This approach will allow us to study backward dispersion and relate Lagrangian studies to scalar mixing, at Taylor-scale Reynolds numbers up to 1000.

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