Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Scale relations, coherence, and Reynolds number effects in turbulent mixing with differential diffusion C.J. BROWNELL, L.K. SU, Johns Hopkins University — Measurements confirm a non-negligible effect of differential molecular diffusion in turbulent mixing at moderate Reynolds numbers. This is significant to reacting flow systems, where local laminarization arises from heat release. Through planar measurements of scalar and velocity fields in turbulent, non-reacting jets, we explore the effects of differential diffusion over a range of length scales, the correlation of differential diffusion at varying scales to the large-scale mixing organization of the jet, and the effect of the local Reynolds number, including those that span the turbulent transition. For example, we have found that the maximum variance of differential diffusion occurs away from the jet centerline, confirming previous numerical studies. Also, under certain conditions, slower-diffusing scalars are preferentially advected to the perimeter of the jet which may arise from buoyancy effects.

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Date submitted: 11 Aug 2005 Electronic form version 1.4