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Development of turbulent variable density mixing in jets with coflow JOHN CHARONKO, KATHY PRESTRIDGE, Physics Division, Los Alamos National Laboratory — Fully turbulent jets with coflow at two density ratios (At=0.1 & 0.6) were studied as a statistically stationary system for improving our understanding of variable density mixing in turbulent flows. The exit Reynolds number was matched for both flows at ∼19,000 and simultaneous planar PIV and acetone PLIF measurements were acquired so the coupled evolution of the velocity and density statistics could be examined in terms of density-weighted average quantities. Measurements were taken over 10,000 snapshots of the flow at three locations to insure statistical convergence, and the spatial resolution (288 μm) was at or below the Taylor microscale. In agreement with our previous work at lower Reynolds numbers, for large density ratios turbulent kinetic energy and Reynolds stresses are preserved or increased with downstream distance, contrasting with the behavior at low density ratios. Furthermore, in regions where the buoyancy effects began dominating the initial momentum-driven flow (∼30 jet diameters), the jet is still not developing toward a self-similar state. Instead, a region of homogeneous turbulence appeared to establish itself in the center of the jet even for the lower density ratio condition, in contrast with classical results for single-fluid jets.

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