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Effect of large density ratios on turbulence budgets in buoyant jets with coflow JOHN CHARONKO, KATHY PRESTRIDGE, Los Alamos National Laboratory — Turbulence statistics and energy transport budgets have been measured in two fully turbulent jets with coflow at density ratios of $s = 1.2$ & 4.2 to improve our understanding of variable-density mixing in turbulent flows. The exit Reynolds number was matched for both flows at ∼20,000 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 assure statistical convergence, and the spatial resolution (288 μm) is well below the Taylor microscale. Variable-density effects caused changes in both the magnitude and distribution of the evolving turbulence, with differences most pronounced within the jet half-width. As the jet tends toward pseudo self-similarity, a new scaling based on effective diameter and density successfully scales the energy budgets of the two jets, but significant differences were still seen in the core. For the high density ratio jet, the turbulent kinetic energy production is negative on the centerline, as opposed to slightly positive, leading to large changes in advection and diffusion. A mechanism for these differences is proposed.

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