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**Liquid droplet formation and dispersion characteristics in a turbulent round jet.**[1] PETER DEARBORN HUCK, RODRIGO OSUNA-OROZCO, University of Washington, NATHANAEL MACHICOANE, Universite Grenoble Alpes, ALBERTO ALISEDA, University of Washington — We present experimental results for mixing characteristics in a two-phase spray in a turbulent round jet spray for momentum ratios $M = (\rho_g/\rho_l)(v_g/v_l)^2 = 25 - 176$, where $\rho_g$ ($\rho_l$) and $v_g$ ($v_l$) are the densities and velocities of the gas (liquid) phase, respectively. Spray formation near the nozzle creates droplets with a distribution of inertia that makes them interact differently with the gas turbulence. At low $M$ values, the spray is populated by droplets whose timescales are of the same order as the largest eddies. As $M$ increases, the droplets in the spray have low Stokes numbers with respect to these eddies. The resulting droplet-turbulence interactions lead to mixing that results in concentration profiles that are broader than for a passive scaler and become progressively narrower as $M$ increases. We find a critical value ($M_c$) that separates these two regimes which controls the distribution of large and small particles across the spray. For $M < M_c$ where the concentration profiles are broad, the largest particles are found on the edges, with the smallest average diameter near the centerline. The inverse occurs for $M > M_c$. These observations allow us to formulate an a priori model to predict important operational spray characteristics.

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