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Prediction of a Densely Loaded Particle-Laden Jet using a Euler-Lagrange Dense Spray Model[1] PEDRAM PAKSERESHT, SOURABH V. APTE, Oregon State University — Modeling of a dense spray regime using an Euler-Lagrange discrete-element approach is challenging because of local high volume loading. A subgrid cluster of droplets can lead to locally high void fractions for the disperse phase. Under these conditions, spatio-temporal changes in the carrier phase volume fractions, which are commonly neglected in spray simulations in an Euler-Lagrange two-way coupling model, could become important. Accounting for the carrier phase volume fraction variations, leads to zero-Mach number, variable density governing equations. Using pressure-based solvers, this gives rise to a source term in the pressure Poisson equation and a non-divergence free velocity field. To test the validity and predictive capability of such an approach, a round jet laden with solid particles is investigated using Direct Numerical Simulation and compared with available experimental data for different loadings. Various volume fractions spanning from dilute to dense regimes are investigated with and without taking into account the volume displacement effects. The predictions of the two approaches are compared and analyzed to investigate the effectiveness of the dense spray model.

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