Verification of Eulerian–Eulerian and Eulerian–Lagrangian simulations for fluid–particle flows$^1$ BO KONG, Ames Laboratory, RAVI G. PATEL, Cornell University, JESSE CAPECELATRO, University of Michigan, OLIVIER DESJARDINS, Cornell University, RODNEY O. FOX, Iowa State University and Ames Laboratory — In this work, we study the performance of three simulation techniques for fluid-particle flows: (1) a volume–filtered Euler–Lagrange approach (EL), (2) a quadrature–based moment method using the anisotropic Gaussian closure (AG), and (3) a traditional two-fluid model. By simulating two problems: particles in frozen homogeneous isotropic turbulence (HIT), and cluster–induced turbulence (CIT), the convergence of the methods under grid refinement is found to depend on the simulation method and the specific problem, with CIT simulations facing fewer difficulties than HIT. Although EL converges under refinement for both HIT and CIT, its statistical results exhibit dependence on the techniques used to extract statistics for the particle phase. For HIT, converging both EE methods (TFM and AG) poses challenges, while for CIT, AG and EL produce similar results. Overall, all three methods face challenges when trying to extract converged, parameter-independent statistics due to the presence of shocks in the particle phase.

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