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Evaluation of Point-Particle Models in Shock-Particle Bed Interactions[1] RAHUL BABU KONERU, University of Florida, BERTRAND ROLLIN, Embry-Riddle Aeronautical University, FREDERICK OUELLET, S. BALACHANDAR, University of Florida — In this work, 3D Euler-Lagrange (EL) point-particle simulations of shock- particle cloud interaction are presented for two cases (i) shock interacting with a stationary bed of particles and (ii) a multiphase shock tube. In an effort to improve the point-particle models, results from these EL simulations are compared against particle-resolved (PR) Euler simulations in case of the stationary bed and experiments from the Multiphase Shock Tube facility at Sandia National Laboratories (SNL). In the stationary bed simulations, it is observed that at low incident shock Mach numbers and particle volume fractions (10%-15%), the point-particle models predict the average gas properties reasonably well. As the effects of compressibility become more prominent (presence of bow shocks), the models predict a higher drag than that is observed in the PR simulations. A sensitivity analysis is performed to identify the force components responsible for this additional drag. In the case of the multiphase shock tube, the effects of particle collisions and the initial curtain profile on the curtain expansion rate are explored. The particle collisions in this case are modeled using a soft-sphere type DEM model in CMT-Nek.

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