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Effect of Microstructural Geometry for Computing Closure Models in Multiscale Modeling of Shocked Particle Laden Flow OISHIK SEN, H.S. UDAYKUMAR, Univ of Iowa, GUSTAAF JACOBS, San Diego State University — Interaction of a shock wave with dust particles is a complex physical phenomenon. A computational model for studying this two-phase system is the Particle-Source in Cell (PSIC) approach. In this method, the dust particles are tracked as point particles in a Lagrangian frame of reference immersed in a compressible fluid. Two-way interaction between the carrier and the dispersed phases is ensured by coupling the momentum and energy transfer between the two phases as source terms in the respective governing equations. These source terms (e.g. drag force on particles) may be computed from resolved numerical simulations by treating each macroscopic point particle as an ensemble of cylinders immersed in a compressed fluid. However the drag so computed must be independent of the geometry of the mesoscale. In this work, the effect of the stochasticity of the microstructural geometry in construction of drag laws from resolved mesoscale computations is studied. Several different arrangement of cylinders are considered and the mean drag law as a function of Mach Number and Volume Fraction for each arrangement is computed using the Dynamic Kriging Method. The uncertainty in the drag forces arising because of the arrangement of the cylinders for a given volume fraction is quantified as 90% credible sets and the effect of the uncertainty on PSIC computations is studied.

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