Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Effect of Finite Particle Size on Convergence of Point Particle Models in Euler-Lagrange Multiphase Dispersed Flow.[1] SAMAUN NILI, CHANYOUNG PARK, RAPHAEL T. HAFTKA, NAM H. KIM, S. BALACHANDAR, Center for Compressible Multiphase Turbulence, University of Florida — Point particle methods are extensively used in simulating Euler-Lagrange multiphase dispersed flow. When particles are much smaller than the Eulerian grid the point particle model is on firm theoretical ground. However, this standard approach of evaluating the gas-particle coupling at the particle center fails to converge as the Eulerian grid is reduced below particle size. We present an approach to model the interaction between particles and fluid for finite size particles that permits convergence. We use the generalized Faxen form to compute the force on a particle and compare the results against traditional point particle method. We apportion the different force components on the particle to fluid cells based on the fraction of particle volume or surface in the cell. The application is to a one-dimensional model of shock propagation through a particle-laden field at moderate volume fraction, where the convergence is achieved for a well-formulated force model and back coupling for finite size particles. Comparison with 3D direct fully resolved numerical simulations will be used to check if the approach also improves accuracy compared to the point particle model.

[1]Work supported by the U.S. Department of Energy, National Nuclear Security Administration, Advanced Simulation and Computing Program, as a Cooperative Agreement under the Predictive Science Academic Alliance Program, under Contract No. DE-NA0002378.

Samaun Nili
Univ of Florida - Gainesville

Date submitted: 01 Aug 2017 Electronic form version 1.4