Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

A Subgrid Particle Averaged Reynolds Stress Equivalent (SPARSE) model for Eulerian-Lagrangian particle-laden-flow simulation[1]

SEAN DAVIS, GUSTAAF JACOBS, san diego state university — The direct Eulerian-Lagrangian simulation of turbulent, particle-laden flow through the Navier-Stokes equations combined with the tracing of a large number of particles is computationally expensive for large-scale problems. To reduce computational cost, small scale turbulence is often modeled and groups of physical particles are amalgamated into clouds, whose average location is traced. Typical Lagrangian models (such as Particle-Source-In-Cell and Cloud-In-Cell models) assume that the average motion of the cloud is governed by only the average interphase momentum difference between the carrier and disperse phases, neglecting subscale perturbations. We present a new Lagrangian particle model for the tracing of clouds of particles in particle-laden flows. By expanding the particle drag correction factor to include fluctuating terms and Reynolds averaging the full particle momentum equation, the so-called SPARSE model accounts for the effect of subgrid turbulence and particle perturbations. A priori results demonstrate the efficacy of the SPARSE model in 1D velocity fields and 3D decaying isotropic turbulence computations.

[1]We gratefully acknowledge suport from AFOSR

Gustaaf Jacobs
san diego state university

Date submitted: 30 Jul 2015 Electronic form version 1.4