Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Modeling Dilute Gas-Solid Turbulent Flows using Moment Methods DENNIS DUNN, KYLE SQUIRES, None — Numerically modeling particle-fluid interactions in turbulent two-phase flows has proven quite useful, and although Lagrangian particle-tracking methods are a plausibly accurate approach, these models are often limited to dilute flows and can be inaccurate in regions of locally large particle concentrations where inter-particle interactions and effects of two-way coupling can be significant. These and other considerations motivate the current effort aimed at implementing Eulerian-based approaches that treat the particle phase as a continuum. The specific focus of the current effort is on modeling dilute particle-laden turbulence in which the gas-phase carrier flow is populated with a second phase of small, dispersed solid particles possessing material densities much larger than that of the carrier flow, and consequently large particle Stokes numbers. The approach adopted in this work is derived from the quadrature-based method of moments. Simulations are conducted of a particle-laden turbulent boundary layer. The gas-phase carrier flow is computed using DNS and the results show that the carrier flow drives the particulate phase via the drag force and with resulting structural interactions, e.g., preferential concentration of particles, similar to those observed in Lagrangian particle tracking simulations. Further comparisons are made against simulations using Lagrangian particle tracking of the dispersed phase and demonstrate the utility of the Eulerian approach, e.g., with statistical descriptors in reasonable agreement between the two methods.

Dennis Dunn
None

Date submitted: 20 Sep 2013 Electronic form version 1.4