Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Particle-Laden Turbulent Kolmogorov Flow[1] LIAN-PING WANG, University of Delaware — Modulation of the carrier phase turbulence by finite-size inertial particles have been studied experimentally, but only recently it is possible to study this computationally through particle-resolved simulation methods. In addition to parameters governing the flow, the nature of modulation depends on at least four dimensionless parameters associated with the dispersed phase: the dimensionless particle size, volume fraction, particle-to-fluid density ratio, and dimensionless sedimentation velocity. Both augmentation and attenuation of the carrier phase turbulence have been reported, and the published results are often difficult to comprehend and sometime are inconsistent. Here we present results of a relatively simple setting, namely, a turbulent Kolmogorov flow laden with finite-size inertial particles. This flow setting has connection to both channel flow and homogeneous flow. We apply the lattice Boltzmann method to simulate the carrier phase turbulence and to resolve the surface of moving solid particles. Both turbulent augmentation and attenuation are found to exist, depending on the system parameters. We will report on results of large-scale energy production and local profiles near the particle surface, to help interpret the results of turbulence modulation.

[1]This work is partially supported by the National Science Foundation.

Lian-Ping Wang
University of Delaware

Date submitted: 31 Jul 2013 Electronic form version 1.4