Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Stochastic modeling of fluid-particle flows in homogeneous cluster-induced turbulence ALESSIO INNOCENTI, SERGIO CHIBBARO, Univ Pierre et Marie Curie, RODNEY FOX, Iowa State University, MARIA VITTORIA SALVETTI, University of Pisa — Inertial particles in turbulent flows are characterized by preferential concentration and segregation and, at sufficient mass loading, dense clusters may spontaneously generate due to momentum coupling between the phases. These clusters in turn can generate and sustain turbulence in the fluid phase, which we refer to as cluster-induced turbulence (CIT). In the present work, we tackle the problem of homogeneous gravity driven CIT in the framework of a stochastic model, based on a Lagrangian formalism which includes naturally the Eulerian one. A rigorous formalism has been put forward focusing in particular on the terms responsible of the two-way coupling in the carrier phase, which is the key mechanism in this type of flow. Moreover, the decomposition of the particle-phase velocity into the spatially correlated and uncorrelated components has been used allowing to identify the contributions to the correlated fluctuating energy and to the granular temperature. Tests have been performed taking into account also the effects of collisions between particles. Results are compared against DNS, and they show a good accuracy in predicting first and second order moments of particle velocity and fluid velocity seen by particles.

Alessio Innocenti
Univ Pierre et Marie Curie

Date submitted: 27 Jul 2016 Electronic form version 1.4