Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Stochastic four-way coupling of gas-solid flows for Large Eddy Simulations[1] THOMAS CURRAN, FABIAN DENNER, BEREND VAN WACHEM, Imperial College London — The interaction of solid particles with turbulence has for long been a topic of interest for predicting the behavior of industrially relevant flows. For the turbulent fluid phase, Large Eddy Simulation (LES) methods are widely used for their low computational cost, leaving only the sub-grid scales (SGS) of turbulence to be modelled. Although LES has seen great success in predicting the behavior of turbulent single-phase flows, the development of LES for turbulent gas-solid flows is still in its infancy. This contribution aims at constructing a model to describe the four-way coupling of particles in an LES framework, by considering the role particles play in the transport of turbulent kinetic energy across the scales. Firstly, a stochastic model reconstructing the sub-grid velocities for the particle tracking is presented. Secondly, to solve particle-particle interaction, most models involve a deterministic treatment of the collisions. We finally introduce a stochastic model for estimating the collision probability. All results are validated against fully resolved DNS-DPS simulations. The final goal of this contribution is to propose a global stochastic method adapted to two-phase LES simulation where the number of particles considered can be significantly increased.

[1]Financial support from PetroBras is gratefully acknowledged.

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Date submitted: 31 Jul 2017 Electronic form version 1.4