Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

A subgrid model for inertial particle clustering in large-eddy simulations of turbulence BAIDURJA RAY, ANDREW D. BRAGG, LANCE R. COLLINS, Cornell University — Existing subgrid models for inertial particles in large-eddy simulations (LES) of turbulence do not correctly predict particle clustering. Synthetic turbulence models such as kinematic simulations (KS) have been shown to capture many features of fully developed turbulence, at low computational cost. The presence of small-scale flow structure (with a specified energy spectrum) makes KS an attractive choice for reconstructing the subgrid fluctuations seen by inertial particles in a LES. We apply such a model (referred to as KSSGM) to a filtered isotropic turbulence simulation with particles. Preliminary results show that the KSSGM is able to recover the RDF for moderately large Stokes numbers (for which clustering is still significant) and shows the correct qualitative trend in the RDF for smaller Stokes numbers (St). This suggests that the effect of subgrid scales on the high St particles is simpler than for particles having time-scales of the order of the Kolmogorov time-scale or less. Importantly, the KSSGM captures the opposing effect of the subgrid scales on clustering of particles with high and low St, which may stem from the fact that the KSSGM is able to describe the spatially correlated nature of the subgrid velocity field experienced by a particle pair.

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Date submitted: 02 Aug 2012 Electronic form version 1.4