Abstract Submitted
for the DFD09 Meeting of
The American Physical Society

High-inertia particle acceleration statistics in a turbulent channel flow VALENTINA LAVEZZO, ALFREDO SOLDATI, Dept. of Energetics and Flow Machinery, University of Udine, Udine, Italy, ZELLMAN WARHAFT, LANCE COLLINS, Sibley School of Mechanical and Aerospace Engineering, Cornell University, Ithaca, NY — Recent experiments in a turbulent boundary layer (Gerashchenko et al., 2008) have shown that the variance in the acceleration fluctuations of small, heavy particles in the near wall region increases with increasing inertia, contrary to the trend found for homogeneous and isotropic turbulence. In a previous study, we ran direct numerical simulations (DNS) of inertial particles in a channel flow to show how this phenomenon is related to the coupling of particle motion with shear and gravity. In this work, we extended the DNS to a much broader range of particle Stokes number (20, 40 and 100). The trend for the mean and variance of the particle-acceleration statistics at these much higher Stokes numbers are consistent with what previously was found for homogeneous and isotropic turbulence. We attribute this behavior to the inertial filtering by the particles of the underlying turbulent flow, as though at these higher Stokes numbers particles sample a more nearly isotropic flow field. The effect of gravity also has been considered and will be presented in detail.

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Date submitted: 08 Aug 2009 Electronic form version 1.4