Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Distribution and velocity of inertial particles in a turbulent channel flow FILIPPO COLETTI, KEE ONN FONG, ANDRAS NEMES, NICHOLAS SLOAN, University of Minnesota — The segregation of inertial particles in specific regions of turbulent fluid flows is a well known phenomenon, but experimental observations of its three-dimensional nature are lacking. Here we are concerned with the transport of small inertial particles in wall-bounded turbulence. In particular we consider a fully developed vertical channel flow. The working fluid is air laden with size-selected glass particles. The volume and mass loading are kept low and the particle diameter is smaller than the viscous length scale, so that the turbulence is unaffected by the dispersed phase. Tomographic particle image velocimetry is used to reconstruct the position and velocity of the inertial particles. In particular, the tendency of the particles to concentrate intermittently (turbulence clustering) and to drift towards the wall (turbophoresis) are quantitatively characterized by the instantaneous and mean concentration fields, respectively. The findings are discussed in relation to the results of previous studies which have used one-way coupled direct numerical simulations, and on which the current understanding of this class of flows is based.

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Date submitted: 01 Aug 2015 Electronic form version 1.4