Abstract Submitted
for the DFD06 Meeting of
The American Physical Society

Experiments and models of inertial particles in high Reynolds number turbulence. S. AYYALASOMAYAJULA, Cornell University, A. GYLFASON, Reykjavik University, Z. WARHAFT, L. COLLINS, Cornell University, E. BODENSCHATZ, Max Plank Institute for Dynamics and Self-organization, INTERNATIONAL COLLABORATION FOR TURBULENCE RESEARCH COLLABORATION — We present measurements of the probability density function (pdf) of inertial particles in high Reynolds number wind tunnel, turbulent flow. The particles are water droplets, sprayed into the tunnel at the grid, and the Lagrangian trajectories are determined by high speed camera moving with the mean flow. The Stokes number is varied from 0.1 to 0.5 and the Taylor Reynolds number is 250. Inertial particles are expected to have trajectories differing from fluid (inertia-less) particles in the same flow. For example they may be ejected from regions of high vorticity and accumulate in regions of high strain. Here we show that the tails of the pdf become narrower than that of a fluid particle as the St increases. By means of a simple simulation consisting of a potential array of vortices we mimic the measurements of the pdf. On the other hand, subjecting the inertial particles to a fluid velocity obtained from a stochastic model of the Lagrangian fluid velocity (B.L . Sawford, Phys. Fluids 3 (6), 1577 (1991)) yields no change in the normalized pdf. The implications of these results are discussed in terms of selective sampling of inertial particles compared to those of fluid particles. The work is supported by the US National Science Foundation.

Sathyanarayana Ayyalasomayajula
Cornell University

Date submitted: 07 Aug 2006 Electronic form version 1.4