Abstract Submitted
for the DFD06 Meeting of
The American Physical Society

Inertial particle clustering in turbulence: A comparison of experimental results with theory[1] E.W. SAW, R.A. SHAW, Department of Physics, Michigan Technological University, S. AYYALASOMAYAJULA, Z. WARHAFT, Mechanical & Aerospace Engineering, Cornell University — In order to test the validity of recent theoretical and computational (DNS) predictions on inertial particle clustering in turbulence, we have investigated the spatial distribution of particles (water droplets) in high-R_λ laboratory turbulence. The experimental facility is an active-grid wind tunnel, generating nearly homogeneous and isotropic turbulence with maximum $R_\lambda \approx 10^3$. Droplets are sprayed into the flow and downsteam their diameter, longitudinal speed, and arrival time are recorded with a phase Doppler interferometer. We calculate pair correlation functions $\eta(r)$ conditioned on droplet diameter d, to show how the scale-dependence of clustering changes with Stokes number ($St = (1/18)(\rho_d/\rho)(d/r_k)^2$, where r_k is the Kolmogorov microscale, and ρ_d and ρ are the droplet and air mass densities, respectively). We then compare the scale dependence of the pair correlation functions with various power law relations suggested from previous theoretical work, all of which have the form $\eta(r) \propto (r/r_k)^{-f(St)}$.

[1]Supported by the U.S. National Science Foundation.

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Date submitted: 07 Aug 2006 Electronic form version 1.4