Abstract Submitted
for the DFD07 Meeting of
The American Physical Society

Particle clustering in turbulence: Bridging the gap between experiments and Simulations E.W. SAW, Physics, Michigan Tech. Univ., JUAN SALAZAR, L.R. COLLINS, Mechanical & Aerospace Eng., Cornell Univ., R.A. SHAW, Physics, Michigan Tech. Univ. — Direct numerical simulations (DNS) of inertial clustering in turbulence are usually performed with monodisperse particles having uniform-random initial spatial distribution. In these simulations, clustering statistics (e.g. radial distribution function) are obtained using full 3D spatial distribution. However, due to realistic constraints, most experiments to date are done with significant polydispersity, non-uniform particle initial spatial distribution and lower dimensional sampling. Here we pick as an example a recent wind-tunnel study of spray injected droplets using phase Doppler interferometers (PDI). Comparisons of results from both sources are often ambiguous. In view of this, we ran two DNS with polydisperse particles (matching experimental conditions). One of these initiates with a uniform-random spatial distribution while the other initiates with particle concentrated in the center of the simulation volume to imitate spray injection. We study the effect of polydispersity and initial inhomogeneity on the 3D radial distribution function. In addition, we resample the particles in 1D to simulate measurement by a PDI and compare the results with the wind-tunnel data. We will present our findings, with emphasis on how they will ease analysis of experimental results.

Ewe-Wei Saw
Physics, Michigan Tech. Univ.

Date submitted: 06 Aug 2007 Electronic form version 1.4