Abstract Submitted
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Wind tunnel experiments on the interactions between turbulence and small inertial droplets[1] COLIN BATESON, ALBERTO ALISEDA, University of Washington — Understanding the dynamics of particles in turbulent flows is important to many engineering and environmental problems including spray atomization as well as cloud- droplet growth and precipitation. Specifically, we have studied the effect of turbulence on droplet collision-coalescence in an effort to clarify its role in the process of warm rain formation. We are exploring the hypothesis that turbulence-induced-collisions can explain the size gap between the limit of condensational growth and the onset of gravitational collisions and sedimentation. We use wind tunnel experiments to study the evolution of water droplets in homogeneous, isotropic, slowly decaying grid turbulence. We analyze the process of preferential concentration and the enhanced relative velocity of droplets in the 1-100 micron range due to their inertial interactions with the underlying turbulence. We collect droplet size and velocity data from a Phase Doppler Particle Analyzer (PDPA) to understand the influence of turbulence on the droplet collision kernel, and to quantitatively model it in terms of the Radial Distribution Function. We use high-speed visualizations to obtain two-dimensional droplet velocity fields to validate the PDPA point measurements, and to model the relative velocity distribution as a function of droplet pair spacing and Stokes number.

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