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Preferential accumulation, enhanced relative velocity and gravitational settling due to inertial droplet interactions with turbulence COLIN BATESON, ALBERTO ALISEDA, University of Washington — We are exploring the hypothesis that, during warm-rain formation, 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 preferential concentration and the enhanced relative velocity of droplets in the $10 - 200\ \mu m$ range due to their inertial interactions with the underlying turbulence. Data from Phase Doppler Particle Analysis and flow visualizations provide insight into the droplet relative velocity and settling velocity fields. We focus on those fields' dependency on droplet Stokes number and local concentration. Recent improvements to our experimental setup allow for high-magnification, high-speed imaging of the flow inside the wind tunnel. We use these images to observe near-droplet dynamics and collision events, with the ultimate goal of formulating a model for droplet collision-coalescence efficiency that can be used in numerical simulations and parameterizations of turbulence-induced droplet collisions.

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