Abstract Submitted
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Simultaneous measurements of droplet clustering and turbulence in cumulus clouds[1] R.A. SHAW, Dept. of Physics, Michigan Technological University, K. LEHMANN, Leibniz-Institute for Tropospheric Research, E.W. SAW, Dept. of Physics, Michigan Technological University, H. SIEBERT, Leibniz-Institute for Tropospheric Research — Droplet clustering in clouds due to turbulence may act to accelerate the formation of rain through droplet coalescence. Theory and computations suggest that clustering strength depends on the droplet Stokes number, which is proportional to $d^2\varepsilon^{1/2}$, where d is droplet diameter and ε is turbulence energy dissipation rate. To evaluate this hypothesis we have made simultaneous (in time and space) measurements of droplet spatial distribution, droplet size distribution, and turbulent velocity. The latter allows calculation of local energy dissipation rate. Measurements were made using the Airborne Cloud-Turbulence Observation System (ACTOS) deployed via helicopter. To increase confidence in the clustering measurements two instruments, collocated in space, and based on different operating principles and measurements geometries, were used for the clustering measurements. Clustering signatures are present and tend to increase with droplet Stokes number. The role of gravitational sedimentation in modulating inertial clustering of cloud droplets is explored.

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