Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

An economical model for simulating droplet spectrum evolution in turbulent cloud chambers and wind tunnels STEVEN KRUEGER, University of Utah, Salt Lake City, UT, W. CANTRELL, Michigan Technological University, Houghton, MI, D. NIEDERMEIER, Leibniz Institute for Tropospheric Research, Leipzig, Germany, R. SHAW, Michigan Technological University, Houghton, MI, F. STRATMANN, Leibniz Institute for Tropospheric Research, Leipzig, Germany — Although airborne instruments provide detailed information about the microphysical structure of clouds, the measurements provide only a few snapshots of each cloud. Deducing the droplet spectrum evolution from such measurements is next to impossible. We are using two alternative approaches: laboratory studies and numerical simulations. The former relies on a new turbulent cloud chamber (the Pi Chamber) at Michigan Technical University, as well as the first humid turbulent wind tunnel (LACIS-T) at the Leibniz Institute for Tropospheric Research. Both produce conditions for droplet growth (i.e., supersaturation) by mixing saturated vapor at different temperatures. The Pi Chamber produces turbulence by inducing Rayleigh-Bénard convection, while the wind tunnel generates turbulence with a grid. We are using the Explicit Mixing Parcel Model (EMPM) to numerically simulate droplet spectrum evolution in these flows. The EMPM explicitly links turbulent mixing and droplet spectrum evolution by representing a turbulent flow in a 1D domain with the linear eddy model. The EMPM can economically span scales from those of the smallest turbulent eddies to those of the largest. The EMPM grows or evaporates thousands of individual cloud droplets according to their local environments.

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Date submitted: 01 Aug 2017 Electronic form version 1.4