



Development of equilibrium raindrop size distribution in natural rain.

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The NASA's Global Precipitation Measurement (GPM) mission dual-frequency precipitation radar retrieval has adopted a three-parameter gamma distribution to retrieve the raindrop size distribution (DSD) from dual-frequency precipitation radar (DPR) measurements. Recent analysis from disdrometric measurements collected during GPM ground validation (GV) field experiments shows that the three-parameter gamma distribution does not well fit the observed spectra in the presence of collisional break-up, i.e. when the DSD reaches the equilibrium stage.

An automatic algorithm is used to select equilibrium DSD in six datasets for a total number of more than 12,000 minutes with rain rate higher than 5 mmh⁻¹ collected from 2-DVD disdrometers. The algorithm is based on the analysis of the DSD slope in the interval 1.0-2.5 mm diameter. The 1-minute time series are studied in order to assess the conditions more favorable for equilibrium DSD to take place, showing the transition between the one-peak DSD to the 2-peak DSD, for selected case studies, over a wide range of rainrate values.

The results are discussed in terms of precipitation type and intensity, showing a very rapid onset and dissipation of equilibrium DSD conditions. The temporal evolution of some DSD parameters is also analyzed, and, for two of the six datasets (MC3E and Wallops), was also possible to evaluate the small-scale spatial structure of equilibrium DSD.