An important goal of the Dual-frequency Precipitation Radar (DPR), aboard the Global Precipitation Measurement (GPM) core satellite, is to derive rain rate by estimating parameters of the rain drop size distribution (DSD) that is often modeled by an analytical function, such as the gamma with two or three unknown parameters. The inability of the modeled DSD to represent actual hydrometeor spectra and to characterize their intrinsic variations in time and space lead to errors in the estimates of precipitation rate obtained from the DPR. Understanding the uncertainties in rain rate estimation that depends on DSD parameterizations is important not only in evaluating the overall performance of DPR retrieval algorithms but also in gaining insight into ways to improve the algorithms. We will investigate performance of dual-wavelength radar techniques in rain estimates with various assumed DSD models by comparing the radar and hydrometeor parameters obtained from the DSD models with those directly derived from DSD measurements. The relations between the radar parameters and hydrometeor properties are the fundamental components of the radar retrieval in the sense that these relationships serve as retrieval look-up tables (LUT). The LUT is DSD-model dependent. The degree to which the results of the LUT agree with the same quantities derived from measured DSD offers a direct check of the radar retrievals.

In this study, the measured DSD data acquired from a variety of storm systems during several NASA-sponsored field campaigns will be used to create radar reflectivity factors at the Ku- and Ka-band frequencies at which the DPR operates, along with hydrometeor bulk and characteristic size parameters. The DSD data that will be used include the multiple Parsivel-1 and 2DVD observations operated during Iowa Flooding Studies (IFloodS), the Midlatitude Continental Convective Cloud Experiment (MCCE) and data from NASA Wallops Flight Facility in Wallops Island, Virginia as well as Olympic Mountains Ground Validation Experiment (OLYMPEx) field campaign. 

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