



Uncertainties in radar profiler raindrop size distributions estimated from ensemble statistics and optimal estimation theory

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While vertically pointing profilers have been used in the past to estimate the vertical profile of raindrop size distributions (DSDs), uncertainty estimates of each retrieved parameter (reflectivity Z , median raindrop size diameter D_0 , and rain rate R) have not been fully characterized. Understanding the uncertainties of each retrieved parameter is needed in order to understand the error characteristics of scanning polarimetric radar based and satellite based rain rate retrieval algorithms.

Two methods have been developed to quantify the uncertainties of profiler derived DSD parameters. The first method uses ensemble statistics with the same profiler spectra as input but using 42 different retrieval models to estimate the median and spread of the retrieved parameters. The second method uses optimal estimation theory to estimate an optimal solution and a covariance matrix describing the correlations between the retrieved parameters. Both methods are complementary and provide robustness to the parameter estimation and uncertainty.