

Evaluation of S-band radar rain rate retrieval algorithms and precipitation variability over a dense rain gauge network

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The Global Precipitation Measurement (GPM) Precipitation Research Facility (PRF) at NASA Wallops Flight Facility has recorded high temporal (50 second) and spatial (250 m) resolution PPI radar data over a dense rain gauge network using NASA's research-quality NPOL (S-band, dual-polarization) radar. The rain gauge network contains 20 tipping bucket gauge pairs distributed through an approximate 25 square km grid located 30km from the NPOL site. Precipitation rates derived from three polarimetric retrieval algorithms (in polar space) were interpolated to a 1.0 km horizontal resolution grid directly over the gauge network. Rain accumulation bias and Mean Absolute Difference statistics from the polarimetric retrievals and the non-polarimetric Multi-Radar/Multi-Sensor (MRMS) System gauge-adjusted Z-R retrieval (at native resolution of approx. 1km x 1km) were determined via independent gauge comparison from four cases individually and collectively. The analysis investigates how the statistics from the polarimetric and MRMS retrievals vary from event-to-event and in total over 6, 10, and 14 minute accumulation windows, and if there is a preferred retrieval most appropriate for a specific event type. In addition, the dimensions of the dense gauge network were intentionally set to be nearly identical to the GPM Dual-frequency Precipitation Radar (DPR) nadir footprint-scale of 25 square km. The rainfall accumulations within the sub-grid scale footprint indicate variability from 100% - 400% depending on event – this is a significant contributor to error within the comparison method.