A probabilistic Quantitative Precipitation Estimation for ground-based radar networks at high space and time scale

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The uncertainty structure of radar quantitative precipitation estimation (QPE) is a major issue for many applications and has been the subject of many studies. This presentation introduces recent developments to the NEXRAD-based precipitation estimates derived from NOAA/NSSL's National Mosaic & Multi-Sensor QPE (NMQ) platform. Probability distributions of rainfall rates instead of single values are derived using a model quantifying the relation between radar reflectivity and the corresponding "true" reference precipitation. The reference precipitation is derived at 1 km/5 min from radar and gauge with taking advantage of the quantitative reliability of hourly gauge measurements and the fine time resolution of the radar. Ensembles of reflectivity-to-rain rate relationships accounting explicitly for rain typology including hail, snow, convective rain, stratiform rain, and tropical rain are derived for radars over a large area (CONUS). This approach preserves the fine space/time sampling properties of the radar (1 km/5 min) and conditions probabilistic QPE (PQPE) on the rain rate and rainfall type. The PQPE model enables mapping of the quantitative uncertainty in real-time and deriving precipitation exceedance probabilities for precipitation return periods. This study also proposes an evaluation of NMQ at unprecedented fine scale as the NMQ Z-R and Z-S relationships are evaluated with quantification of biases and uncertainties. A systematic bias correction is proposed and its impact at coarser time scale is evaluated. PQPEs are accumulated to the hourly time scale and compare positively to deterministic QPE.