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Quantifying Errors in TRMM-based Multi-sensor QPE Products Over Land in Preparation for GPM

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Determining uncertainties in satellite-based multi-sensor quantitative precipitation estimates over land of fundamental importance to both data producers and hydroclimatological applications. , Evaluating TRMM-era products also lays the groundwork and sets the direction for algorithm and applications development for future missions including GPM. QPE uncertainties result mostly from the interplay of systematic errors and random errors. In this work, we will synthesize our recent results quantifying the error characteristics of satellite-based precipitation estimates. Both systematic errors and total uncertainties have been analyzed for six different TRMM-era precipitation products (3B42, 3B42RT, CMORPH, PERSIANN, NRL and GSMaP). For systematic errors, we devised an error decomposition scheme to separate errors in precipitation estimates into three independent components, hit biases, missed precipitation and false precipitation. This decomposition scheme reveals hydroclimatologically-relevant error features and provides a better link to the error sources than conventional analysis, because in the latter these error components tend to cancel one another when aggregated or averaged in space or time. For the random errors, we calculated the measurement spread from the ensemble of these six quasi-independent products, and thus produced a global map of measurement uncertainties. The map yields a global view of the error characteristics and their regional and seasonal variations, reveals many undocumented error features over areas with no validation data available, and provides better guidance to global assimilation of satellite-based precipitation data. Insights gained from these results and how they could help with GPM will be highlighted.