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Comparison of TRMM satellite and ground validation rain estimates

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One of the important goals of the TRMM mission has been to determine the accuracy and error characteristics of remote satellite rain measurements on instantaneous and monthly time scales. This information provides feedback to the developers of the TRMM rain algorithms. A recent study conducted within the TRMM Satellite Validation Office compared six years of rain retrievals from the TRMM Microwave Imager (TMI), Precipitation Radar (PR) and Combined (COM) algorithms using Ground Validation (GV) data from Kwajalein and Melbourne, FL as a surface-based empirical reference. The study considered a large sample of observations and estimates covering a period from 1999 to 2004. The first part of the study compared 0.5° x 0.5° gridded satellite estimates obtained from the TRMM 3G68 product with similarly gridded GV data. The comparisons were made at the same spatial and temporal scales in order to eliminate sampling biases in our comparisons. In the second part of the study, instantaneous rain rates from the TMI, PR, COM and GV were statistically compared at the nominal scale of the TMI footprint (~ 150 km^2). We calculated the unconditional mean rain rates from PR, COM and GV estimates within each TMI footprint that was observed within 100 km from the respective GV site (and also observed by the PR). I n the first analysis our results showed that all of the respective rain rate estimates agree quite well, with some exceptions. These exceptions were associated with heavy rain events in which one or more of the algorithms failed to properly retrieve these extreme events. In the second analysis, high correlations between TMI, PR, COM and GV were observed, but relative to GV, some problems were observed, especially at the high end of the rain rate spectrum above 20 mm/hr.