Geophysical Research Abstracts,
Vol. 11, EGU2009-12352, 2009
EGU General Assembly 2009

TRMM sampling issues over ground areas of varying size

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The use of ground validation (GV) data is important to any remote sensing satellite mission. Generally, users believe that GV can be directly applied to validate the "correctness" of the satellite retrieval algorithms. In addition, efforts are and have been made to use ground based data to help establish error characterizations of the satellite retrieval algorithms. The effectiveness such approaches often greatly overestimated during the planning stages of mission. Techniques which depend upon the bulk comparisons of GV based vs satellite based rain retrievals are particularly prone to breakdown due to the sampling disparities between the different data sources. During the TRMM mission a number of such bulk comparisons of GV vs TRMM rain retrievals were made and published. They have been used to demonstrate both the "correctness" and the "incorrectness" of the TRMM satellite retrieval algorithms.

Tom Bell, among others, has published a number of substantial papers that dealt with sampling errors inherent in TRMM data. The papers takes a purely statistically approach to the sampling size issue. It provides statistical information of TRMM overpass information over a number of different areas of varying sizes within the TRMM coverage. Care was taken in the selection of the sites to ensure that they were within consistently rainy areas. In the designated areas it provides information about the total number of samples, total rainy samples, as well as stratiform vs convective information. In addition, it provides seasonal sample information. This information is provided for both the wider swath microwave imager and the much narrower swath precipitation radar. This information can also be useful in establishing the feasibility of seasonal comparisons between ground based and satellite based systems when sampling is provided in seasonal groupings over the target areas. It is clear from the results that the sheer lack of rainy samples make any bulk comparisons between ground and satellite rain retrieval very problematic except at very large spatial or temporal aggregations.

These sampling issues are of major importance in the use of GV data for establishing error characterization or satellite retrieval algorithm improvement (except perhaps at the instantaneous level) for the Global Precipitation Measurement (GPM) mission. Indeed, special care is being taken in the planning and implementation of the GPM GV effort to minimize dependence on bulk comparisons.