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Improvements to Reduce Bias in the Real-Time TMPA

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The TRMM Multi-satellite Precipitation Analysis (TMPA) provides 0.25°x0.25° 3-hourly estimates of precipitation in the latitude band 50°N-50°S in two product sets. First, it is computed 6-9 hours after real time using precipitation estimates from TMI, SSM/I, AMSR-E, AMSU-B, and geosynchronous-orbit IR (geo-IR) data, all intercalibrated to a single TRMM-based standard, the TMI-GPROF product. Second, the TMPA is computed about two weeks after the end of each calendar month using the same satellite data as in the real time, but calibrated to the TRMM Combined Instrument (TCI) product, with input from monthly rain gauge analyses. Respectively, these two versions are referred to as the real-time TMPA-RT (3B42RT) and research Version 6 TMPA (3B42) products. The TMPA is seeing use in a number of applications, including flood and landslide diagnoses within the authors' group

The time series of the RT and research products are similar, although the research product performs better both in terms of bias and random error. Over land, this improvement is due to both the TCI calibration and the use of gauges, while over ocean it is the result of TCI calibration alone. Analysis shows that the TMPA succeeds in creating precipitation estimates whose distribution of rainrates replicates the distribution of the original calibrating instrument (currently TRMM-based).

While it is "obvious" that the RT results should be improved by calibrating them against Version 6, achieving this result in a quasi-operational real-time framework has been surprisingly difficult. Specifically, tests of trailing 1-, 2-, or 3-month calibrations were not encouraging. Rather, we have had more success with a sequential application of a climatological monthly calibration by TCI, followed by a climatological monthly calibration by gauge. In this framework, a significant portion of the improvement over land is achieved in the TCI calibration, although presumably if the gauge calibration were done by itself, it would prove more important. One primary motivation for this calibration is to allow a nearly seamless transition between the research-grade record and the real-time record, in addition to the general goal of providing more-accurate RT estimates. We started applying the new calibration algorithm for the publicly posted RT data in early 2009. The regional and seasonal variations in improvement that result from the calibration will be displayed, along with a consideration of how effectively the calibration works at various time and space scales.