A review of recent evaluations of TRMM Multi-satellite Precipitation Analysis (TMPA) research monitoring products against ground-based observations over Indian land and oceanic regions

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Abstract

Reliable information of rainfall over the Indian land and adjoining oceanic regions is crucial for various hydro-meteorological purposes. Multi-satellite rainfall products provide global or quasi-global rainfall maps at regular interval and benefits from the relative advantages of infrared and microwave sensors onboard a constellation of Earth-observation satellites. The Tropical Rainfall Measuring Mission (TRMM) Multi-satellite Precipitation Analysis (TMPA) is one of the most widely used quasi-global high resolution rainfall products for a variety of applications. The existing version 6 (V6) of TMPA products underwent substantial changes with additional inputs and consequently version 7 (V7) data sets were formally released in late 2012. The extensive error characterization of this new version of TMPA data sets is a prerequisite for its widest applicability. This paper highlights the results of recent evaluations of TMPA-3B42 and 3B43 products over the Indian land and oceanic regions against ground-truth observations. Comparison of both the versions of TMPA data sets over the Indian Ocean using gauge observations from the Research Moored Array for African-Asian-Australian Monsoon Analysis and Prediction (RAMA) buoys at monthly scale shows that even though the error associated with higher rainfall is reduced in the V7, the new version shows overall larger bias and root-mean-square error as compared to its predecessor V6. TMPA V7 product is further evaluated at daily scale for an eight-year period (2004-2011) against RAMA buoy observations which shows that TMPA V7 overestimates rainfall compared to observations. However, TMPA V7 underestimates light and heavy rainfall events and the error characteristics show a considerable seasonal variation. The comparison of both the versions of TMPA data sets against gridded gauge-based rainfall data sets over India for the southwest monsoon period of 1998-2010 shows a marginal improvement in V7 over V6, especially in terms of reduced bias. Moreover, TMPA V7 shows better skill than the other contemporary multi-satellite rainfall products over India and can be used with higher confidence for monsoon-related studies. Finally, the potential of combined use of multi-satellite and local gauge data sets for better rainfall estimation is discussed and the scope for optimal rainfall estimation over the Indian monsoon region in future perspective is recommended.