



An assessment of the performance of TRMM satellite data over Saudi Arabia

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Understanding the water resources in arid and semi-arid regions presents a significant challenge due to the lack of complete, reliable and homogenous hydrological data. In-situ data represent an invaluable source of information that can provide insights into the hydrological regimes across the region. However, data are often temporally limited, spatially sparse and may also be poorly maintained, making the interpretation of measurements problematic. To expand the capacity of available in-situ observations, this work is carried out to intercompare satellite based retrievals from the Tropical Rainfall Measuring Mission (TRMM) with observational data across the region. Here, daily data derived from 209 in-situ rain gauges between 1998 and 2013 were examined. Whilst the primary focus of this work was to assess the capability of TRMM to represent the observed rainfall averages in the region, as revealed by a set of accuracy estimation statistics, it also focused on assessing its performance in reproducing extreme wet events that sporadically occur over the region. To accomplish this task, a set of percentiles representing the wet tail of rainfall distribution (e.g., 90th, 95th and 99th percentiles) were computed. Also, daily TRMM and observational data were fitted to Gamma distribution and their parameters (i.e. shape and scale) were compared. Overall, the results indicate that TRMM provides good agreement with the observational rainfall averages across the region, with (Rho) values generally above 0.85. However, the accuracy of TRMM considerably decreases with intense rainfall events (e.g., R95 and R99). Results also show that TRMM slightly overestimates gauged data, with MBE of ~ 0.5 mm. The findings of this research demonstrate that TRMM data can be used to improve the spatial density of rainfall records in sparse-data regions across the Kingdom, keeping in mind its limitation with applications related to extreme wet events.