

Rainfall climatology of Saudi Arabia using TRMM data

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The short-term rainfall climatology regime over Saudi Arabia is obtained from the Tropical Rainfall Measuring Mission (TRMM) data for the period 1998-2009. The TRMM rainfall amounts are calibrated with respect to the rain-gauge data recorded at 29 stations across the country. Day-to-day rainfall comparisons show that the TRMM rainfall trends are very similar to the observed data trends, even if a general overestimation in the satellite products must be highlighted. Besides, especially during the wet season, some of the TRMM algorithm runs tend to underestimate the retrieved rainfalls. The TRMM rainfall data also closely follow the observed annual cycle on a monthly scale. The correlation coefficient for monthly rainfall between the TRMM and the rain-gauge data is about 0.90, with a 99% statistical significance. The spatio-temporal distributions of rainfall over Saudi Arabia are analyzed. Besides the four conventional seasons, this analysis considers the wet (November-April) and dry (June-September) seasons, based on the rainfall amounts recorded. Spring is the highest and winter is the second highest rainfall-occurring season, resulting in large amounts of rainfall during the wet season over most parts of the country. Regional variations in the rainfall climatology over Saudi Arabia are studied through defining four sub-regions. The false alarm ratio, probability of detection, threat score, and skill score are calculated to evaluate the TRMM performance. The country average annual rainfall measured by the TRMM is 89.42 mm, whereas the observed data is 82.29 mm. Thus, the rainfall in Saudi Arabia is suggested as being the TRMM value multiplied by 0.93 plus 0.04. After this calibration, the TRMM-measured rainfall is almost 100% of the observed data, thereby confirming that TRMM data may be used in a variety of water-related applications in Saudi Arabia.