



## **Assessment of the Consistency among Precipitation Products over Arid Regions**

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This study addresses the analysis of the consistency among global precipitation products over arid regions. First, precipitation products were examined against in situ observations from the UAE network. Then, the consistency among the different products was assessed regionally over the Arabian Peninsula and the Sahara Desert. Four distinct independently-derived precipitation products, namely, Global Precipitation Climate Center (GPCC), Willmott-Matsuura 2001 (WM), Tropical Rainfall Measurement Mission (TRMM), and CPC Morphing (CMORPH) were examined. Over the UAE, in situ monthly observations from 6 stations over a time period of 11 years, from 2000 to 2010 inclusive, were used. The correlation with in situ observations, Root Mean Square Error (RMSE), and Relative Bias (rBIAS) were calculated to evaluate the precipitation products. The lowest areal averaged RMSE over all stations, ranging from 3.82mm to 9.98mm, was obtained with the GPCC indicating a higher agreement with in situ observations. The average RMSE of GPCC over the country was 6.18mm. However, the highest areal averaged RMSE, ranging from 9.44 to 19.52mm, was obtained with the WM product with average of 13.57mm. The results showed an overestimation of the observed rainfall values across all products with overall average of 42%. CMORPH product was found to be the most inconsistent products spatially across the UAE with rBIAS ranging from -47% in Al Ain to 372% in Dubai. The correlation with in situ observations was found to be higher with GPCC product ranging from 0.8450 to 0.9494. TRMM was second with an average of 0.8413, ranging from 0.7098 to 0.9248. Furthermore, Mean Relative Difference (MRD) was calculated to investigate the precision among the precipitation products. CMORPH was found to be inconsistent spatially being the lowest estimator for four stations (Adu Dhabi, Al Ain, Sharjah, Ras Al Khaimah) whereas being the highest estimator for the rest two stations (Dubai and Fujairah). Generally, the products were found to be imprecise on their estimation of the precipitation with high uncertainty.

The regional analysis was conducted to investigate the consistency among the precipitation products spatially across the Arabian Peninsula. The Relative Mean Absolute Difference was calculated. Results show that RMAD value maintained a persistent spatial distribution throughout the years. Plus, spatially distributed RMAD displayed a pattern that is in agreement with land surface properties. This result is in agreement with previous studies that indicates the uncertainty in the remote sensed estimation is highly dependent on the characteristics of the land surface.