



The Uncertainties Assessments of the Satellite Derived Rainfall Products

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Abstract

Accurate and consistent rainfall observations are vital for climatological studies in support of better planning and decision making. However, estimation of accurate spatial rainfall is limited by sparse rain gauges distributions. Satellite rainfall products can thus potentially play a role in spatial rainfall estimation but their skill and uncertainties need to be understood across space-time scales. This study aimed at assessing the temporal and spatial performance of 7 satellite products (TARCAT, CHIRPS, TRMM, PERSSIAN-CDR, CMORPH, CMAP and GPCP), in view of determining the most suitable one for climate studies.

High resolution gridded (0.05°) rain-gauge data was used for this assessments for a period of 15 years (1998-2012) over different rainfall characteristic areas in East Africa. For compatibility, the gridded rain gauge data were averaged to match each satellite product's spatial scale. The characteristic areas, were determined using principal component analysis and correlations of monthly rain-gauge observations for a period of 30 years (1981-2012) using 285 stations. However, only 15 stations within the dense rain-gauge network, were used for validation. The categorical (e.g. POD and FAR) and continuous statistics (ME, RMSE, correlation, efficiency, STD) were used to quantify the performance of each product.

The results showed the products' performance was high when rainfall intensity was > 250 mm/month. CMORPH and TRMM showed highest skills in characterizing both low and moderate rainfall intensities.

The short rainfall months (October-December), are dominated by shallow convections which could not be accurately characterized by coarse resolution product (CMAP and GPCP). During the southeast monsoon month (May), all products except CHIRPS showed low skills in characterizing this rainfall regime. Overall, the TRMM, CMORPH and CHIRPS showed high and consistent close agreement with the raingauge data hence suitable for climate studies over the region.