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Assessment of GPM and TRMM Satellite Precipitation Products, and their application for Flood Simulations at Daily Scale in a sparsely gauged watershed;Case of Ghdat basin (High Atlas, Morocco).

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Accurate measurement of precipitation is very important for flood forecasting, hydrological modeling, and estimation of the water balance of any basin. The lack of a weather monitoring network is an obstacle to the accurate measurement of precipitation.

In most of the Moroccan High Atlas Mountains regions, ground observation stations are still unreliable and difficult to access due to several parameters, such as a large spatial and temporal variation of rainfall and ruggedness of topography, which lead to irregularity and scarcity of measuring stations. This area is characterized by arid and semi-arid climates where generally occurred a few rainy days but have experienced significant flash floods.

Consequently, floods are causing extended damages to the population and infrastructures every year. However, research on hydrological processes is limited due to the irregularity of the gauge station network and the large number of gaps frequently observed in the rainfall and runoff data acquired from the gauge stations. Remote sensing precipitation data with high spatial and temporal resolution are a potential alternative to gauged precipitation data.

This study evaluates the performance of the two satellite products: the Tropical Rainfall Measuring Mission (TRMM 3B43V7) Multi-satellite Precipitation Analysis (TMPA) and the Integrated Multi-satellite Retrievals for GPM (IMERG V06) (SPPs) to observed rainfall, at different time scales (daily, monthly, and annual) from 1 September 2000 to 31 August 2017 over the Ghdat watershed, with different statistical indices and hydrological assessment, to evaluate the reliability of these (SPPs) data to reproduce rainfall events by implementing them in a hydrological model, to determine their ability to detect all types of rainfall events.

Daily, monthly, and annual rainfall measurements were validated using widely used statistical measures (CC, RMSE, MAE, Bias, Nash, POD, FAR, FBI and ETS).

The results showed that: (1) The correlation between satellite precipitation data and rainfall

precipitation demonstrated a high correlation on all daily, monthly, and annual scales. (2) The product (TRMM 3B42V7) exhibits better quality in terms of correlation on the monthly and annual scale, while the (GPM IMERG V06) product shows a high correlation on the daily scale compared to the measurements of the gauges. (3) The (GPM IMERG V06) product has better performance regarding the precipitation detection capability, compared to the (TRMM 3B42V7) product which could detect only tiny precipitation events, but not able to capture moderate or strong precipitation events. (4) Flood events can be simulated with the hydrological model using both observed precipitation data and satellite data with the Nash – Sutcliffe model efficiency coefficient (NSE) ranging from 0.65 to 0.90.

According to the results of this study, we concluded that (TRMM 3B42V7) and (GPM IMERG V06) satellite precipitation products can be used for flood modeling and water resource management, particularly in the semi-arid and Mediterranean region.