Assessment of Different Remote Sensed Precipitation Products for Streamflow Modeling in the Tropical Region

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Abstract: The quality of streamflow modeling is limited by the quality of the data used to drive, calibrate and validate the model. Precipitation is the most important input parameter to any hydrological model, so inaccuracies in such data are often cited as serious impediments to successful hydrological model. Many basin hydrology studies have applied the rain gauge data to simulate the streamflow, but such research difficult to be conducted over regions lacking of station data. In some countries, availability of spatially and temporally of precipitation data especially in ungauged basins remain a critical issue due to lacking of financial, technology, expertise and war time. To overcome these problems, this research aim to compare and evaluate three different satellite based precipitation products into the Soil and Water Assessment Tool (SWAT) to simulate daily streamflow at the Johor River Basin in the Malaysia. The precipitation products used to drive simulation including rain gauge, Tropical Rainfall Measurement Mission (TRMM), Global Precipitation Climatology Project (GPCP) and National Centers for Environmental Prediction/Climate Forecast System Reanalysis (NCEP-CFSR). The model is calibrated for period 2005-2006 and validated for period 2006-2007. The Nash-Sutcliffe Efficiency (NSE) and Coefficient of Determination (R^2) are used to assess the model performance. The result show that the NCEP-CFSR performed very well in daily streamflow simulation having good NSE of 0.67 and R^2 of 0.7, followed by GPCP with NSE of 0.33 and R^2 of 0.45, respectively. The TRMM did not show good agreement with observed streamflow at Rantau Panjang station with NSE of 0.11 and R^2 of 0.21. This result indicate that gauge based data still represent the most important representative of actual precipitation in Tropical region, but satellite products can reproduce reasonable and well streamflow for ungauged basin. Improvement of space based precipitation datasets through advance calibration and downscaling process should be conducted in the future to reduce the input uncertainties of the modeling.

Keyword: Streamflow, Precipitation, SWAT, TRMM, GPCP.