

## **Use of rainfall forecast from a high-resolution global NWP model in a hydrological stream flow model over Narmada river basin during monsoon**

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**Abstract:** Use of NWP model rainfall forecast is useful for hydrological modelling for river basins for flood and water management. In this study, the SWAT model is applied to the Narmada river basin to estimate the surface runoff. The capability of the model is tested for the south west monsoon season (June to September) of 2016 and validated against the NCUM global NWP model forecast data up to Day-5. Two heavy rainfall events are used for verification of the global model forecast with the observed data. The two verification events occurring during 1 July to 15 July (mean of 15 days) and 30 Aug to 11 Sept (mean of 12 days) are considered. Using Arc GIS sub watershed boundaries, the drainage network, slope, land use map and soil map are generated for the whole Narmada river basin. The surface runoff is computed by forcing with observed rainfall data as well as the NCUM model rainfall forecasts data as input to the SWAT model. Model simulations are compared at five stations of Narmada namely Balkheri, Sandia, Handia, Hoshangabad and Garudeshwar. Initially, the NCUM model rainfall forecast is compared with the actual observation to evaluate the model performances in terms of bias estimation. Then the surface runoff is computed using the observed rainfall data and NCUM forecast data up to Day-5 and made a comparison to evaluate the SWAT model performances. It is shown that the estimated surface runoff during the two active phases is simulated well with some overestimation during the season. The skill of hydrological simulations is examined during different length of forecasts. It is seen that the SWAT model output performance is related to the NWP rainfall forecast skills. NCUM global NWP model is overestimating rainfall amount (wet bias) by 50 to 70 mm/day over the basin during the two active phases. Further, in all the days of forecasts, the model is showing wet bias over the upper part of the Narmada river basin and a dry bias over the lower part of the basin. The dry bias is seen to be around 5 to 35 mm/day.

**Keywords:** NWP rainfall forecast, SWAT, Surface runoff, Narmada river basin