Rainfall–runoff simulations of extreme monsoon rainfall events in atropical river basin of India

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Abstract: The present study analyzes the runoff response during extreme rain events over thebasin of SubarnarekhaRiver in India using soil and water assessment tool (SWAT). TheSWATmodel is configured for the Subarnarekha River basin with 32 sub-basins. Three gaugingstations in the basin (viz., Adityapur, Jamshedpur and Ghatshila) were selected to assess themodel performance. Daily streamflowdata are taken fromCentralWaterCommission, Indiaô Water Resources Information System. Calibration and validation of the model were performedusing the soil and water assessment tool-calibration uncertainty programs (SWAT-CUPs) withsequential uncertainty fitting (SUFI-2) algorithm. The model was run for the period from 1982to 2011 with a calibration period from 1982 to 1997 and a validation period from 1998 to 2011.The sensitivity of basin parameters has been analyzed in order to improve the runoff simulationefficiency of the model. The study concluded that the model performed well in Ghatshilagauging station with a Nashó Sutcliffe efficiency (NSE) of 0.68 during calibration and 0.62during validation at daily scale. The model, thus calibrated and validated, was then applied toevaluate the extreme monsoon rain events in recent years. Five extreme events were identifiedin Jamshedpur and Ghatshila sub-basins of Subarnarekha River basin. The simulation resultswere found to be good for the extreme events with the NSE of 0.89 at Jamshedpur and 0.96 atGhatshila gauging stations. The findings of this study can be useful in runoff simulation andflood forecasting for extreme rainfall events in Subarnarekha River basin.