Regionalization Study of Satellite based Hydrological Model (SHM) in Hydrologically Homogeneous River Basins of India

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A new semi-distributed conceptual hydrological model, namely Satellite based Hydrological Model (SHM), has been developed under 'PRACRITI-2' program of Space Application Centre (SAC), Ahmedabad for sustainable water resources management of India by using data from Indian Remote Sensing satellites. Entire India is divided into 5km x 5km grid cells and properties at the center of the cells are assumed to represent the property of the cells. SHM contains five modules namely surface water, forest, snow, groundwater and routing. Two empirical equations (SCS-CN and Hargreaves) and water balance method have been used in the surface water module; the forest module is based on the calculations of water balancing dynamics of subsurface. 2-D Boussinesq equation is used for groundwater modelling which is solved using implicit finite-difference. The routing module follows a distributed routing approach which requires flow path and network with the key point of travel time estimation. The aim of this study is to evaluate the performance of SHM using regionalization technique which also checks the usefulness of a model in data scarce condition or for ungauged basins. However, homogeneity analysis is pre-requisite to regionalization. Similarity index (Φ) and hierarchical agglomerative cluster analysis are adopted to test the homogeneity in terms of physical attributes of three basins namely Brahmani (39,033 km^2), Baitarani (10,982 km^2) and Kangsabati (9,660 km^2) with respect to Subarnarekha (29,196 km^2) basin. The results of both homogeneity analysis show that Brahmani basin is the most homogeneous with respect to Subarnarekha river basin in terms of physical characteristics (land use land cover classes, soiltype and elevation). The calibration and validation of model parameters of Brahmani basin is in progress which are to be transferred into the SHM set up of Subarnarekha basin and results are to be compared with the results of calibrated and validated parameter set up of SHM of Subarnarekha basin to test the applicability of SHM in hydrologically homogeneous regions of India.

Keywords: SHM, regionalization, homogeneity, donor catchment, similarity index, cluster analysis