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Programme: Ph. D.

Thesis Title: Terrestrial Water Budgeting using Multi-source Remote Sensing Data in Poorly Gauged River Basins

Name of Thesis Supervisor : Prof. Subashisa Dutta

Name of the Department/ Center to which thesis is submitted : Department of Civil Engineering

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SHORT ABSTRACT

Water budgeting is a challenging task in poorly gauged river basins located at complex and inaccessible mountains. The objectives of this work were set to understand runoff generation process in hilly watersheds of Eastern Himalayan Mountains and simulate it by a developed region-specific rainfall-runoff model. Satellite remote sensing data were used as primary inputs where inconsistent time-series data in mainly two variables, viz. land surface vegetation condition and land surface temperature were recovered by innovative methods. These inputs were used for energy budgeting to estimate the terrestrial water loss by evapotranspiration. With the use of terrestrial water gain from satellite-based precipitation data, hotspots were identified in Eastern Himalaya where hydrological resilience due to preferential storage is seen. Samples were collected from these sites to develop the relationship between physical variables and runoff generation. Later, this relationship was attributed into a developed hydrological model to simulate the hydrological processes at daily scale. The results yielded good accuracy when compared with monthly observed volumes. The surface runoff generation ratio is found to be low but a good amount of runoff volume from base flow is observed. This evidence points out towards possible existence of high velocity preferential flow which might be existing in Eastern Himalayan watersheds. The hydrological model is flexible and can be utilized in other regions, given the macropore properties are collected from field-site experiments.