Geophysical Research Abstracts
Vol. 21, EGU2019-13727, 2019
EGU General Assembly 2019

How Well Does TWI Explain Spatial Pattern of Soil Moisture in Infiltration-Excess Dominated Hillslopes?

Sumit Sen (1), Aliva Nanda (2), and James McNamara (3)

(1) Associate Professor, Indian Institute of Technology Roorkee, Hydrology, Roorkee, India (ssenhfhy@iitr.ac.in), (2) Research Scholar, Indian Institute of Technology Roorkee, Hydrology, Roorkee, India (aliva.rkl2010@gmail.com), (3) Professor, Department of Geosciences, Boise State University, USA (jmcnamar@boisestate.edu)

This study has been conducted in infiltration-excess dominated hillslopes of the Lesser Himalaya, India. Two hillslopes from two different aspects of Aglar watershed (Thatyur, India) were chosen to answer different hydrological questions. Both the hillslopes were instrumented with soil moisture sensors to observe the spatial variability of soil moisture and flume with Odyssey water level sensor to record the runoff at outlet. Moreover, tipping bucket rain gauges were used to quantify the rainfall characteristics during the study period. Hillslopes are surveyed with Real-Time Kinematic (RTK) Global Positioning System (GPS) to understand the detailed topography of hillslopes and to create 0.5m resolution DEM. Seventy two different combination topographic wetness index (TWI) were formed using nine different flow direction algorithms and four different slope algorithms. Further, optimal TWI formulation was identified using linear mixed effects modelling. The optimal TWI model was validated with observed soil moisture by calculating R2 values for different rainfall-runoff events. The negative correlation observed between TWI and soil moisture was due to infiltration-excess runoff. TWI was able to explain 66% of soil moisture variation in the dry season whereas only 54% in a wet season. Runoff generation amount showed direct impact on the coefficient of determination i.e. more runoff (less moisture) causes the low value of R2. The grassed hillslope generated less runoff than the agro-forested hillslope, thus former one showed better R2 value than the later one. These results will be helpful to explain the hydrological connectivity of the Himalayan hillslopes and to model it.