

Digital Elevation Model – an Effective Tool for Modeling Groundwater Recharge

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In this paper, an attempt is made to characterize the spatial heterogeneity of infiltration capacity in a drainage basin using digital elevation models. Infiltration capacity is one of the controlling factors in the formation of stream channels. Higher infiltration capacities reduce the surface runoff due to excess water infiltration into the ground. Channel formation is also a function of the slope and the contributing area. Natural stream channels, if properly graded and adjusted to the present climate; reflect the interactions of local slope, contributing area, and permeability of surface materials. Channel networks can be delineated from a DEM using different criteria, the most comprehensive of which is the slope-area threshold. This method delineates a channel network on the basis of local slope and contributing area, without considering the permeability of surface cover. Hence, the differences in the structure of the two drainage networks, .i.e. the surveyed drainage network obtained from field observation and the simulated network generated from the DEM, is indicative of the spatial heterogeneities in the permeability of the surface materials as shown in this paper. Spatially variable drainage density grids corresponding to the two networks have been used here to obtain difference grids that characterize the spatially variable infiltration capacity of the catchment. The simulated spatial pattern is compared with the actual infiltration measurements in the field using infiltration tests. Strong positive correlation between the observed and modeled infiltration confirms the effectiveness of this technique in the rapid assessment of infiltration variability.

Keywords: infiltration capacity, drainage density, DEM, stream drop, autocorrelation