



Landscape structure controls on runoff generation: simulation of the impacts of structural attributes organization on rainfall-runoff response in a headwater catchment

Jintao Liu (1,2), Xiaole Han (1,2), and Aihua Wang (2)

(1) State Key Laboratory of Hydrology-Water Resources and Hydraulic Engineering, Hohai University, Nanjing, China(hanxiaole90@163.com), (2) Department of College of Hydrology and Water Resources, Hohai University, Nanjing,China

Headwater catchment or hillslope play a key role in basin scale hydrologic processes for up to 95% of the stream flow water has passed over it before reaching the channels. Furthermore, hillslope structures, e.g. topography and soil pattern, have been widely accepted as the most significant control on catchment rainfall-runoff response. Though scientific community has been aware of the importance of hydrologic processes on natural hillslopes, measuring, identifying, and then representing natural hillslopes is still a difficult task, whereas the applicability of the hydrologic model relies mainly on the accuracy and efficiency of representing spatial variations in different catchments. Moreover, we are lack of related theories and methods to tailor the discretization scheme, namely the irregularly topographic characteristics of natural hillslopes in an economic way. On the basis of the earlier research works, the objective of this study is to develop a hillslope-storage-dynamics based rainfall-runoff model that employing natural hillslopes as fundamental discretization units. The distinct characteristics of this model rest in an artful and conceptual consideration of landscape structural attributes. The model was firstly developed and validated in the 1.35km² Hemuqiao EXperiment Station (HEXS), in which high resolution terrain relief data as well as intensive soil attributes as soil thickness and hydraulic parameters were measured. The effects of different organization modes of hillslope structures in HEXS model on runoff prediction were assessed.