DETERMINATION OF DISCHARGE STORAGE RELATION USING NUMERICAL MODELS FOR HOMOGENEOUS 2D VERTICAL HILLSLOPE

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Recently hillslope Hydrology is being an area of debate and some new concepts are still emerging concerning flow generated from hillslope catchments. This paper determines the relation Q(S), (where Q is the discharge and S is the saturated storage in the subsurface soil), as function of some simple (and dimensionless) structural parameters and also using simple representative geometrical shape with the assumption of continuous constant recharge flux to the subsurface, to be used in lumped models for different slopes. The models use Q(S) and continuity in a way much similar to the kinematic model employed in surface hydrology. The catchment is characterized by a homogenous 2D vertical hillslope and we are interested in a two-dimensional subsurface flow problem in a hillslope catchment area represented by a rectangular domain. The physical quantities are dimensionless and have been solved simultaneously at real time. Therefore, the output parameters those are interested for this work have been also dimensionless. We assume that the water flow in the subsurface is described by dimensionless physical parameters of the Richard's equation and used Comsol to solve the numerical problem. Saturated storage (S) Vs outflow relationship has developed for subsurface storm flow and simple analytical expression that can describe the relation has been identified as power law function Q=f(S)=aS^b , where a & b are constant parameters depend on some physical and hydraulic parameters, therefore, from the result S-Q relationship curves for different slopes which are identical with the power function of the exponent b having the value within the range determined using other data driven models (eg. Wittenberg [1999]). The saturated storage discharge relationships changes its shape from the convex to concave upward when we employed from gentle slope to the steep and behave non linearity.