

GIS Based Rainfall Runoff Modelling

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ABSTRACT

Hydrological modeling is of prime importance for hydrologists in planning, design and operation of water resources related structures. It also acts as an efficient tool to forecast flood disasters. In gauged basins there are observed rainfall-runoff data for the storms, but in the case of un-gauged basins, a rainfall runoff relationship must be established to meet the requirements of design of hydraulic structures. In this study rainfall runoff modelling is carried out in a GIS environment. Digital Elevation Models can be used to derive a wealth of information about the morphology of a land surface using algorithms traditionally used for processing raster data. The key objectives of this study are to create a Digital Elevation Model in GIS, to derive the parameters required for the modeling process from the created Digital Elevation Model. Various topographic attributes such as slope, catchment area and aspect can be derived from DEM. The parameters obtained namely flow length and slope is used to calculate the time of travel for the segmented flow length. From the flow length map and slope map, the isochrone map is prepared. The area between two isochrones is calculated and tabulated. From the tabulation the Time-Area diagram is derived for the study area. Area routing technique is used to derive the ordinates of the Unit Hydrograph. The soil and land use maps were digitized and the areas under each soil type and land use were derived. Weighted overlay analysis was done for soil type and land use and the cumulative curve number for the watershed was found. Dependability analysis was done for the available rainfall data. 75% dependable rainfall was taken for analysis. A rainfall event was chosen from this year to find the rainfall excess, using SCS method. The rainfall excess was distributed among the Unit Hydrograph ordinates to arrive at the storm hydrograph. This method can be used to obtain Unit hydrograph of any duration and consequently storm hydrograph in this basin for design purposes. From the results derived it is inferred that GIS is a powerful tool for Rainfall Runoff Modelling.