

Synthesizing Unit Hydrographs from Elevations

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Abstract

Characterization of hydrologic processes of a watershed requires estimation of the specific time-response characteristics of the watershed. In the absence of observations these characteristics are estimated from watershed physical characteristics. An exploratory assessment of a particle-tracking approach for parameterizing unit hydrographs from topographic information for applicable Texas watersheds is presented. The study examined 126 watersheds in Texas, for which rainfall and runoff data were available with drainage areas ranging approximately from 0.65 to 388 square kilometers, main channel lengths ranging approximately from 1.1 to 80 kilometers, and dimensionless main channel slopes ranging approximately from 0.0002 to 0.02. Unit hydrographs based entirely on topographic information were generated and used to simulate direct runoff hydrographs from observed rainfall events. These simulated results are compared to observed results to assess method performance. Unit hydrographs were also generated by a conventional analysis (of the observed data) approach to provide additional performance comparison. The results demonstrate that the procedure is a reasonable approach to estimate unit hydrograph parameters from a relatively minimal description of watershed properties, in this case elevation and a binary development classification. The method produced unit hydrographs comparable to those determined by conventional analysis as thus is a useful synthetic hydrograph approach.