Characteristics of short interval rainfall for Punpun basin

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ABSTRACT

Estimation of flood peaks for small catchments are required for water resources planning. flood forecasting, design of various drainage systems, flood control and design of hydraulic structures etc. For this purpose, one of the simple and widely used techniques is based on design excess-rainfall and unit hydrograph approach. In this technique, the design excess-rainfall is convoluted with the unit hydrograph appropriate to the catchment for estimation of flood hydrograph resulting from the design excess-rainfall. For small catchments which have time of concentration in a few hours, long term short interval rainfall data are required for estimation of design storms.

In this study, an attempt has been made to study the characteristics of short interval rainfall data of the Punpun river basin lying in Bihar, which has been identified as the representative basin for the NIH-Centre for Flood Management Studies, Patna. The areal extent of the Punpun basin is 8,630 km2. There are 11 raingauge stations located in the Punpun river basin, out of which only Gaya station is having self recording raingauge. Using the hourly rainfall data of Gaya raingauge station. the daily rainfall data of rest of the 10 ordinary raingauge stations have been converted into the hourly data. Thiessen polygon method has been used for computing the average areal rainfall for the study area. Depth area duration (DAD) and depth duration frequency (DDF) curves have been prepared for the study area. The DAD curves have been developed for various durations viz. 1 h, 2 h, 3 h, 6 h, 9 h, 12 h, 18 h and 24 h. For the aforesaid durations DDF curves have also been prepared for different return periods i.e. 5, 10, 25, 50 and100 years using the L-moment based general extreme value (GEV) distribution. Using the excess-rainfall of the design storm duration, floods of the various return periods have been estimated for the sub-basin defined by the bridge number 462 of the Punpun basin. For this purpose, the DDF curves developed for the Punpun basin up to Hamidnagar gauging site, based on the data of five raingauge stations and the unit hydrograph of the sub-basin defined by the bridge number 462 have been utilized. The average annual maximum rainfall excess data of the design storm duration for the various years have also been convoluted with the Linn hydrograph and the annual maximum flood peaks have been calculated for the respective years. The annual maximum peak flood series

derived based on this procedure has been used for estimating the floods of various return periods. The floods of various return periods computed by frequency analysis of rainfall and frequency analysis of annu4 maximum peak floods have been compared.