

Development of regional flood frequency relationships using L-moments for Middle Ganga Plains Subzone 1(f) of India

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ABSTRACT

In this study, screening of the data has been carried out based on the discordancy measure (D) in terms of the L-moments. Homogeneity of the region has been tested using the L-moments based heterogeneity measure, H . For computing the heterogeneity measure H , 500 simulations were carried out using the four parameter Kappa distribution. Based on this test, it has been observed that the data of 8 out of 11 bridge sites constitute a homogeneous region. Hence, the data of these 8 sites have been used in this study. Catchment areas of these 8 sites vary from 32.89 to 447.76 km² and their mean annual peak floods vary from 24.29 to 555.21 m³ s⁻¹. Comparative regional flood frequency analysis studies have been carried out using the various L-moments based frequency distributions viz. Extreme value (EV1), General extreme value (GEV), Logistic (LOS), Generalized logistic (GLO), Normal (NOR), Generalized normal (GNO), Uniform (UNF), Pearson Type-III (PE3), Exponential (EXP), Generalized Pareto (GPA), Kappa (KAP), and five parameter Wakeby (WAK). Based on the L-moment ratio diagram and $|Z_i^{\text{dist}}|$ -statistic criteria, GEV distribution has been identified as the robust distribution for the study area. For estimation of floods of various return periods for gauged catchments of the study area, regional flood frequency relationship has been developed using the L-moments based GEV distribution. Also, for estimation of floods of desired return periods for ungauged catchments, regional flood frequency relationship has been developed by coupling the regional flood frequency relationship with the regional relationship between mean annual maximum peak flood and catchment area.