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Model-Based Clustering Approach for Regional Flood Frequency Analysis

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Abstract: A major challenge in the field of hydrology is to estimate the relationship between the magnitude and frequency of floods which is one of the most dangerous natural hazards that causes huge loss to livelihood of human resulting in number of fatalities. Regional flood frequency analysis using model-based clustering approach has been developed to estimate the flood quantiles for the return periods 2, 5, 10, 20, 25, 50, 100, 200, 500 and 1000 years. The approach has been carried out on the flood frequency attributes of 61 gaging stations in Indiana, United States. The primary objective is to derive the regional quantiles for the ungauged sites where the amount of information available is very little. L-moments are derived for the sites and discordance measure removes the discordant sites from the study. The proposed approach Bayesian Information Criterion (BIC) resulting in 2 clusters are proved to be homogeneous when applied to the Indiana streams. Goodness of fit measures is extensively applied in determining the error statistics for evaluating the performance of the model. Results show that the proposed approach in estimating the flood frequency and magnitudes are very accurate and hence useful for water resources planning and management.

Keywords: Frequency analysis, Clustering, L-moments, Bayesian information Criterion, Return period