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Annual Peak Rainfall Data Augmentation – A Bayesian Joint Probability Approach for Catchments in Lesotho

ABSTRACT

The main problem to be investigated is how short duration data records can be augmented using existing data from nearby catchments with data with long periods of record.

The purpose of the investigation is to establish a method of improving hydrological data using data from a gauged catchment to improve data from an ungauged catchment. The investigation is undertaken using rainfall data for catchments in Lesotho.

Marginal distributions describing the annual maximum rainfall for the catchments, and a joint distribution of pairs of catchments were established. The parameters of these distributions were estimated using the Bayesian – Markov Chain Monte Carlo approach, and using both the single-site (univariate) estimation and the two-site (bivariate) estimations.

The results of the analyses show that for catchments with data with short periods of record, the precision of the estimated location and scale parameters improved when the estimates were carried out using the two-site (bivariate) method. Rainfall events predicted using bivariate analyses parameters were generally higher than the univariate analyses parameters.

From the results, it can be concluded that the two-site approach can be used to improve the precision of the rainfall predictions for catchments with data with short periods of record. This method can be used in practice by hydrologists and design engineers to enhance available data for use in designs and assessments.

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