REGIONAL FREQUENCY ANALYSIS OF ANNUAL MAXIMUM PRECIPITATION IN SOUTH KOREA

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Abstract

Reliable frequency analysis requires randomness of observations which included in a population. Sufficient sample needs to fit an appropriate probability distribution and estimate parameters (Institute of Hydrology, 1999; Potter and Lettenmaier, 1990, Heo et al., 1990; Cunnane, 1989; Stedinger and Tasker, 1985). Single-site analysis is not appropriate if the record length is shorter than target return period T. Sample sizes of annual maximum rainfall data in Korea are usually smaller than 50 years. Therefore, it is essential to use regional frequency analysis for estimating rainfall quantiles of more than 100 years return period of rainfall quantiles.

In this research, regional frequency analysis is applied to annual precipitation maxima of South Korea in order to improve reliability on rainfall quantiles. Homogeneous regions are identified by Fuzzy-c means cluster analysis(Bezdek, 1981) and generalized logistic distribution is selected as an appropriate distribution by goodness-of-fit test. Three frequency analysis techniques such as at-site frequency analysis, index flood method, and regional shape estimation method are compared and analyzed based on L-moments. The performance of regional frequency analysis is checked by Monte Carlo simulation.

The following are concluded.

(1) Fuzzy-c means method divides 378 sites over 10 years of South Korea into 14 regions. All regions are found to be homogeneous by the heterogeneity measure H. GLO is identified as the appropriate frequency distribution by the goodness-of-fit measure Z.

(2) There is little difference between at-site and region frequency analysis for long record length. However, quantiles by at-site frequency analysis are not robust for short record length.

(3) Simulation experiments show that regional frequency analysis is more appropriate in South Korea and index flood method is more robust in case of large regional L-CV, small range of sites' L-CVs in a region, and short record length.

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