

Abstract

Regional flood frequency analysis is one of the methods used for estimating flood quantiles in ungauged watersheds. In traditional methods, hydrologic homogeneous regions are created based on watersheds attributes such as physiographic, geographic location and flood records data in each station. Most of watersheds have a little similarity to other watersheds of the region. Therefore, one cannot fully assign a watershed to one group. The fuzzy clustering algorithm allows a watershed to be a member the all regions (groups). In this study, ability of fuzzy clustering algorithm has been tested for regionalization of Mazandaran province's watersheds. To improve homogeneity of the regions clustered by this algorithm, that are not statistically homogeneous, the suitable techniques have been given. In addition, the performance of seven evaluation indexes of fuzzy clustering including Xie-Benni, Kwon, FPI, NCE, CE, PC, FS has been represented to determine the optimal number of clusters. Then, the homogeneity of each region obtained by fuzzy clustering algorithm was evaluated by heterogeneity statistic of Hosking and Wallis. Hydrological homogeneous regions were determined by combining two fuzzy clusters. The results show that two indices of Xie-Benni and Kwon have better performance than others. Also Z^{DIST} statistic for each of three hydrologic homogeneous regions was estimated by using FORTRAN programming language for 3-parameter distributions, and generalized logistic distribution chosen as the best regional distribution. The parameters of this distribution were calculated by L-moment method, and then flood quantiles with different return periods for each station were estimated by regional relations. According to the results of this study, fuzzy clustering can be used to achieve the hydrological homogeneous regions in the other regions of Iran.

Keywords: Regional frequency analysis, L-moment, Hydrology homogeneity, Fuzzy clustering



University of Zabol
Graduate school
Faculty of Agriculture
Department of Water engineer

**The Thesis Submitted for the Degree of Master of Science
(In the Field of Water engineer)**

Regionalization of Mazandaran Province's Watersheds by Using Fuzzy Cluster Analysis

Supervisors:

Dr. P. Haghight jou
Dr.Z.Shamohammadi Heidari

Advisor:

Dr. A.Moghaddam Nia

By:

F. Farsadnia

June 2011