Precipitation Classification of Northwest of Iran Using Cluster Analysis and Discriminate Analysis

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Introduction

Planning and management of water resources in Iran are affected by tempo-spatial distribution of rainfall. Therefore, study of precipitation can be a vital variable for evaluating water resources in different parts of Iran. Since climatic data are increasing in bulk study the individual places takes, therefore using of multivariate regionalization methods are inevitable. Recently, multivariate methods of cluster analysis has been used widely in climatic regionalization and it provides desirable results. Another method of multivariate is polynomial analysis that is less frequently used. In the latter if a number of classes are used the result of regionalization can be tested. In present study precipitation of Northwest of Iran is classified using eight characteristics of precipitation using cluster analysis and were tested by discriminant analysis methods.

Materials and Methods

For this study rainfall profile of 260 stations Northwest are analyzed. After arranging the required data, 3360 monthly maps from elements have been made by the kriging interpolation method, after removal of outside cells, 5374 cells remain within the study area. Data matrix for the regionalization was obtained by the mentioned maps in 92 column and 5374 row. Cluster analysis used for classification. So that the distance of the cell obtained by Euclidean distance coefficient and precipitation groups linked by 'Ward' linkage method. To obtain the optimal number of classes precipitation average method and the comparison process of elements have been used. Finally, four groups of precipitation were obtained in Northwest of Iran.

In order to test the accuracy of the results of cluster analysis, discriminant analysis was used. The results of discriminant analysis accepted qualifications of cluster analysis in classification. So that results obtained from discriminant analysis in 97.6 percent of the regional area conform to the results of cluster analysis.

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Differences in the results of these methods were in border cells of groups and for appointment to own groups of these cells, their subsequent probability were used.

Results and Discussion

Northwest precipitation groups are as follows:

1. The first group (low concentrated precipitation region with moderate snowfall): The first group has 306.5 mm of total annual rainfall and 33559.9 of area. It is located in two separate parts of the South East of study area and near of Oroumieh Lake.
2. The second group (Moderate precipitation region with tendency to low distributed precipitation and much snowfall): the second group has 348.3 mm of total annual rainfall and 62847. 65 of area. It is located in the northern half of the study area. This group is allocated more than half the area of the Northwest.
3. The third group (much concentrated precipitation region with low snowfall): the third group has 631.2 mm of total annual rainfall and 4972.27 of area and it is located in the Southwest of study area.
4. The fourth group (moderate precipitation region with tendency to much distributed precipitation and moderate snowfall): The fourth group has 436.8 mm of total annual precipitation and 17290.22 of area. It is located in two separate parts in the south to the west and the central part of the study area.

In comparing the groups some differences in the amounts of precipitation, distribution of precipitation, snow days and start of rainfall season in groups are detected. Amount of annual rainfall in high rainfall group is more than double of low rainfall group. Linear functions obtained from discriminant analysis determined the boundary between these groups.

Keywords: precipitation – regionalization - cluster analysis – discriminant analysis – northwest of Iran