Identifying of Drought Regions of Gilan Province Using Rainfall Anomaly Index and Cluster-Distance Analysis

Mahmood Khosravi1 * Zahraie. A2 Haydari. H3 Baninaiemeh. S4
1 Department of Geography, Sistan and Baluchestan University, Zahedan, IRAN
2 M.Sc Student of Geography, Sistan and Baluchestan University, Zahedan, IRAN
3 M.Sc Student of Geography, Sistan and Baluchestan University, Zahedan, IRAN
4 M.Sc Student of Geography, Islamic Azad Tehran University, Tehran, IRAN

Introduction

Drought is a climatic hazard that occurs in the vast areas throughout the world. It causes physical suffering, economic losses, and Environmental instability. Drought is a slowly developing very which is phenomenon, and it is very difficult to determine when a dry spell becomes a drought or when a severe drought becomes an exceptional drought. It is usually starting with less dramatic effects than other natural disasters, but its effects are long lasting and widespread (Mavi and Tupper 2004). Meteorological droughts are characterized by a lack of precipitation, often combined with higher than normal potential evapotranspiration, for a long period of time and over a large areas. Meteorological drought indicators use precipitation data to determine meteorological droughts.

This paper is focused on drought hazard distribution and its Environmental impacts in the Gilan province. We used the precipitation data as Meteorological drought indicators to determine Meteorological droughts.

Study Area

The Gilan province is one of the most humid regions in the northern of Iran is located in the southern Caspian Sea Coasts. Gillan Province with an average precipitation of 1100mm has a temperate and humid climate. Yearly precipitation is distributed through Mid-September to late April. This rainfall makes up nearly 80 percent of the total precipitation during the year (tajdari2: 1390).

Material and Methods

In this paper the precipitation data of 32 Rain Gauge Stations of Gilan province in 30 years period were extracted. For monitoring and zoning droughts conditions in this region some indices and methods were used. Roy presents rainfall Anomaly Index (RAI) in 1965. The rainfall anomaly index is based on the calculation of standard deviation values from the normal precipitation amounts. For trends analysis of droughts data the non-parametric tests are utilized. The trend tests classified into two categories of parametric can d non-parametric tests. Parametric tests make certain assumptions about the data in which the test is performed. First, there is the assumption that the data is drawn from a normal distribution. The using of nonparametric techniques has a long tradition in time series analysis. Non-parametric (distribution-free) methods, which relax the assumptions, may serve as an alternative. There is no assumption of normality of data in non-parametric tests at the same time. So if we are not sure about the normality, it seems more prudent to use non-parametric tests. Cluster analysis is a way to divide a data set into useful and homogenized subsets (clusters or categories) with the same features. Data that are similar set in one cluster, where data are dissimilar set in separate clusters.

* Email: Mahmood.Khosravi@Gmail.com Corresponding Author 00989151412281
Results and Discussion

In this study the precipitation data of rainfall stations were analyzed. Precipitation sandly sis showed that the maximum precipitations concentrated in the coast al region like Anzali, Castle River, Astara and Bash mahaleh. Minimum precipitations in southern parts of the province around Manjil, Gavard and Paroud bar can be seen. In the next step the trend sin precipitation time series based on non parametric methods were determined. The results showed that there is no trending the precipitation time series. Then the coefficients of drought for the stations based on rainfall anomaly index were extracted. After determining the coefficients, the percent age frequency of occurrence and severity of drought zoning were plotted for theperiod1389-1360. The results of frequency analysis showed that the highest frequency of weak droughts (with 20 to 26% frequency of occurrence) is located in the central region sand around the north western of province. The highest frequency of occurrence of moderate droughts is located near the Hashtpar station with 20 to 27 percent frequency of occurrence. In the severe droughts, parts of east and southern and north west province and marginal areas have the greatest percentage the frequency of occurrence and finally the highest frequency of occurrence of very severe droughts in the southern corner of the province was seen.

Conclusion

A cluster analysis by Euclidian distance and Ward method was applied to the Droughts data. Testing different methods to determine the number of clusters, 4 clusters were finally chosen. These clusters have an accept able percent of similarity in the droughts zoning identification. The first cluster extended to the most areas in central and somewhat in northern of province. The second cluster is the most extensive drought areas in the province, which is covered some regions in western, central and northern of province. The third clusters located in the south and south west of province and finally the fourth clusters located as a distinct area in the eastern corner of the province. According to the results of analysis of the droughts occurrence frequency, the second, first, fourth and third clusters priorities are in risk of drought.

Finally it should be considered that with regard to sensitive vegetation in humid areas such as Gilan, lack of moisture and drought risk can be more severe than the dry regions.

Key Words: Drought, Rainfall Anomaly Index (RAI), Cluster analysis, Gilan Province.