

A survey of the occurrence and persistence probability of rainy days using Markov chain model (Case study of Shiraz city, Iran)

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ABSTRACT:

One of the basic needs in the planning of water resources is prediction of water amount for agricultural, industrial and urban consumption. Thus, it is required to predict the water capability of each region at different time intervals for efficient planning via reliable and suitable methods. Probable analyses are useful methods to recognize and predict some phenomenon including precipitation. One of the methods commonly used is Markov chain. Markov chain is a special state of models in which the current state of a system depends upon its previous states. The present study studied the frequency and persistence of rainy days in Shiraz city, Iran by the existing statistics of the daily precipitation of 62 years (1956-2016) meteorology stations in Shiraz city using Markov chain model. In this study, due to a few numbers of daily precipitations in June to September days, these months are not considered. The daily precipitation data are ordered based on the frequency matrix of the state change of occurrence of dry and wet days and transition matrix is calculated based on the maximum likelihood method. In the present study, by exact statistical methods, the suitable order of Markov chain is determined and applied. The stationary probability matrices and return period of persistence of rainfall days (2-5 days) were calculated for the mentioned months. The results showed that precipitation occurrence probability in each day was 0.164 and the probability of precipitation non-occurrence was 0.836. Also, it was shown that the highest occurrence probability of precipitation days was in January and February and it was observed that precipitation in Shiraz city had heterogeneous time distribution.

Keywords:

Markov chain, Rainy day, Dry day, Persistence, Return period.