Exploring the Extreme Precipitation in Tehran Province Using the Peak Over Threshold Values Model

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Introduction

Recently, high extreme and frequency distribution of higher sequence of precipitation have been attended more. Through this, because of geographical characteristics of each area, diverse and different thresholds have been presented and utilized for the mentioned precipitation's characteristics. Through the present research, for exploring and analyzing the extreme precipitation event in Tehran through the 1983-2016 statistical periods, some of the indexes presented by World Meteorological Organization Committee were utilized.

Data and Method

The study area in the present study is Tehran province. Tehran province is located in the center of Tehran, with an area of about 12981 square kilometers, between 34 to 36.5 degrees north latitude and 50 to 53 degrees east longitude. Data from Abali and Mehrabad synoptic stations were selected daily for use in the present study during the statistical period of 2016-1983. Before analysis, the data were subjected to quality control and homogeneity test. In cases where for any reason there were incomplete data in the data series of each station, they were reconstructed and supplemented.

Analysis of non-parametric I-Kendall trend and age slope estimator

In the present study, in order to study and analyze the trend of limit events, the indexes provided by the National Climate Committee of the World Meteorological Organization and the Acceptable Research and Climate Prediction Research Program, abbreviated as ETCCDMI, are used. These indexes are part of a set of indexes presented by the World Meteorological Organization's Working Group on Climate Change (Peterson et al., 200: 341), which are used by numerous researchers for analysis in different parts of the world.

Model of peak values Above the threshold (POT)

The POT first fits the set limit and then one above this threshold with the generalized parity distribution. In the present study, the ninety-fifth percentile was considered as the initial threshold (Coelho et al., 2008: 120; Friederichs, 2010, 211). The test threshold was then set to determine whether it was appropriate or inappropriate. In recent years, two visual methods have been developed to select the threshold. In the present study, methods were used to validate the selected threshold. The first method is the description of residual life, also known as conditional excess (Lechner et al., 1992: 229). In the MRL method, the excess rate is plotted from the threshold to the threshold .

How to estimate GDP distribution parameters using the maximum likelihood method

For different estimates, there are several methods such as torques, possible weighted moments, the existence of correct representation, and so on. However, the most efficient performance method is evaluated as the most complete method (Rao and Hamed, 2000: 21). Therefore, in the present study, the correct method of displaying the work was used.

Results and Discussion

The results of man-condensate precipitation statistics at the studied stations. The results obtained from Mann-Kendall test showed that no significant trend in success level was experienced in the studied stations in the statistical period of 1983-2016. Except that in Abali station, the reduction of the number of consecutive dry days and in Mehrabad station, the reduction of the one-day rate (PX1day) at the level of 90% is significant. One day exhibition at Mehrabad station is a downward trend in the level of 90% confidence with the rate of 1.9 days in the last decade. During the statistical period of 2016-1983, no significant trend was experienced in relation to the index of the number of values for 5 consecutive days. The annual show on other days does not make sense. The number of days with more than 10 mm (R10) and the number of days with more than 20 mm (R20) and the number of days with threshold (Rnn) in the two study stations are not significant.

In this study, using the Mann-Kendall non-parameter test and sen slope estimator, the final rainfall trend analysis was performed at Abali and Mehrabad stations. According to the results of the Mann-Kendall test, the display of consecutive dry days (CDD) showed a decrease of 8.5 days per decade at Abali station. But on consecutive wet days (CWD) the upward trends are not significant. The Daily Intensity Index (SDII) is also significant without trend. One day exhibition at Mehrabad station is a downward trend in the level of 90% confidence with the rate of 1.9 days in the last decade. In Abali station with confidence intervals (-0.08, -0.11) and Mehrabad station with confidence intervals (-0.09), the figure is zero. Therefore, in these stations, it has a thin sequence with finite torque that is close to producing a show.

The study of growth curves showed that in the 34-year statistical period (1983-2016), most events in stations have a return period of 1 to 10 years. In higher return periods, fewer observations are consistent. The confidence bands of the growth curves also showed to some extent that the deviation of the POT model is less even in the return periods. But as the return period increases,

the confidence interval increases. This indicates that as the period increases, the uncertainty in the results increases that the extrapolation of the data is in the range beyond the time frame of the statistical period under study (34 years). Reliable bands have shown that return periods of 1000 years are too unreliable to use in practical applications.

Conclusion

The aim of this study is to investigate the changes in the intensity and frequency in Tehran province during the period 1983-1916. In this regard, the study of the initial trend of rainfall showed that in relation to the marginal rainfall, most of the backgrounds had a downward trend in the region. The study of the sequence behavior of events and the frequency and intensity of these events, using them, are higher than the thresholds that have increased in frequency in the study areas. The results of this part of the study are highly consistent with the work of Rahimzadeh et al. (2009) who reported negative trends for cold-bounded appearances and thresholds for precipitation and positive trends for warm-range indices in 27 synoptic stations in Iran. Rahimzadeh and Hedayat Dezfuli (2011) also showed intensification of heating and decrease along with extreme fluctuations and temperature limit power in Hormozgan province and Mohammadi and Taghavi research (2005) increased the frequency of hot limit indices and cold limit index indices in the city. Has stated Tehran. Maroufi et al. (2011) have achieved similar results in studying the trend of borderline events in the northern and southern coasts of Iran. Also, the estimates and severity of precipitation boundary events using the mean time intervals between events (ARIs) indicate return periods of 1 to 10 years for boundary precipitation. Finally, the resulting Q - Q diagrams and Chi - square test (χ 2) showed that the POT model has great potential for modeling precipitation limit events in the study area.

Key Words: Extreme Precipitation, Peak Over Threshold Values Model, ARIs Returning Period, Tehran Province

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