Identification of Extreme Precipitation Events in the West of Iran (1965-2016)


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**Introduction**

Climate extreme events have expanded and intensified during the 21st century. Extreme precipitation event annually leads to severe damage in agriculture, environment, infrastructures and even the human loss. Therefore, identification of the behavior of such events is one of the pivotal aspects of climatic change and the increase of information about extreme precipitation is tangibly necessary for the society especially with regard to those, living in the areas with high risk of flood. extreme precipitation events can be defined as significant deviations from the precipitation mean. As a result, to identify such precipitations, a criterion was needed to evaluate the rate of precipitation values' deviation from mean. Importantly, given the different types of indicators and thresholds proposed for extracting extreme precipitation, choosing an appropriate threshold with climatology conditions of the study region which could also be capable of identifying extreme precipitation optimally in terms of amount and frequency, requires high precision. The present study aimed at identifying the extreme precipitation events in the west of Iran through introducing the appropriate threshold and spatial scale for the extraction and investigation of these events.

**Data and Methods**

The west of Iran with the areaof 230760 square kilometers includes about 14% of total area of Iran. Zagros Mountains, stretching from northwest to southeast, are the most important feature of the west of Iran. Two databases have been used in this study. The first database regardsthe precipitation data of 1129 synoptic stations, climatology and rain gauge in the west of Iran. The stations statistics have been checked in terms of existence of any outlier. Ultimately 823 stations out of 1129, were used for producing gridded data. The gridded data, are the results from the interpolation of daily precipitation observations since January 1st 1965 to December 31st 2016, using Kriging interpolation method and spatial separation of 6*6 kilometers. the final base, a matrix possessing the dimensions of18993*6410 (representing time on the rows and place on the columns) was developed. The second database referred to the Sea-level pressure patterns (Hectopascal).

To identify such precipitations, in addition to the main threshold that includesthe mean of precipitation more than 75th percentile for each pixel per day of a year, a second threshold including the standard deviation of these precipitations (with the values of one, two, and three times more) has been also added to the mean. Accordingly, three groups of extreme precipitation were identified in the region which were separated according to the spatial zone that had been covered. Moreover, the sea-level pressure patterns were extracted with regard to these precipitations for each zone andthen classified using clustering analysis technique.

**Results and Discussion**

three groups of precipitations with different coverage zoneswere identified: 1- 83 days with equal to or

more precipitation than the mean of precipitations more than 75th percentile plus one time standard deviation which cover more than 40% of the region. 2- 144 days with equal to or more precipitation than the mean of precipitations more than 75th percentile plus two times standard deviation which cover more than 20% of the region. 3- 82 days with equal to or more precipitation than the mean of precipitations more than 75th percentile plus three times standard deviation which cover more than 20% The maps of 7 participation groups of the first type in comparison with 6 precipitation groups of the second and third type contain common and repetitive patterns. Each precipitation maps of the second and third types explains a type of patternand there is minimum overlapping in the maps. Therefore, the precipitations are obtained from the most particular and distinct atmospheric patterns. considering the three properties of 1- equality of precipitation groups of type two and three (both include 6 groups of atmospheric patterns). 2- repeating the atmospheric patterns of precipitation of type two prominently in the precipitations of type three. 3- the formation of the most optimum atmospheric modeling for the precipitations of both thresholds in the zones of 20% and higher, in the west of Iran, the extreme precipitations refer to those with higher means of recipitations more than 75th percentile plus two times standard deviations,have mostly occurred in the zone of 20% and higher of the region.

**Key Words:** extreme precipitation, pervasive event, 75th percentile, standard deviation, west of Iran

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