

Analysis of Daily Precipitation Extreme Indices Trend in Iran

Hossein Mohammadi

Professor of climatology, Faculty of Geography, University of Tehran

Ghasem Azizi

Associate professor of climatology, Faculty of Geography, University of Tehran

Faramarz Khoshakhlagh

Assistant professor of climatology, Faculty of Geography, University of Tehran

Firooz Ranjbar*

PhD in climatology, Faculty of Geography, University of Tehran, Malek Ashtar University of technology

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Extended Abstract

Introduction

Climate change caused some changes in the global environmental conditions in the recent decades. One of the climate change impacts is the disturbance of the hydro- climatic cycle in the world. The effects of climate change on the hydrological cycle are including changes in groundwater levels, lakes, as well as changes in the distribution of rainfall timing and intensity and river flows. Intensity and frequency of extreme precipitation events and the risk of floods and droughts are increasing due to the climate change in the large parts of the world.

The impact of climate change on spatial and temporal characteristics of precipitation and extreme events affected people life. Hence, study on trend and changes of precipitation extreme can reveal the occurrence of every related hazard. The studies around the world have shown that global warming and climate change impacts and the precipitation condition have been altered in different regions. The main objective of this study is to evaluate daily precipitation indices trend in Iran.

Methodology

In order to analyze daily precipitation indices trend, 47 synoptic stations were used to investigate the precipitation extreme events over Iran during the 1982- 2012 (11323 consecutive days). The RClimDex software was applied to extract daily precipitation trend.

The list of precipitation indices are:

- RX1day: Monthly maximum 1-day precipitation
- Rx5day: Monthly maximum consecutive 5-day precipitation

* E-mail: [Fanjbar464@gmail.com](mailto:Franjbar464@gmail.com)

Tel: +989179284863

- R10: Annual count of days when $PRCP \geq 10\text{mm}$
- R20: Annual count of days when $PRCP \geq 20\text{mm}$
- CDD: Maximum number of consecutive days with $RR < 1\text{mm}$
- CWD: Maximum number of consecutive days with $RR \geq 1\text{mm}$
- R95p: Annual total PRCP when $RR > 95\text{th percentile}$
- R99p: Annual total PRCP when $RR > 99\text{th percentile}$
- PRCPTOT: Annual total PRCP in wet days ($RR \geq 1\text{mm}$)

Results and discussion

On average, the amount of precipitation in climatic stations such as Bam, Zabul, Yazd, Tabas, Jask and Zahedan was less than 80 mm whereas Bandar Anzali, Rasht, Ramsar and Noshahr stations have experienced above 1000 mm of precipitation during the period, 1982- 2012. Among all studied stations, Anzali and Zabol stations have had about 1763 and 52 mm of precipitation during the studied statistical period, respectively. Investigation of total index of annual precipitation in Iran represents that the slope of precipitation in most of the stations is negative during the 1982- 2012. Averagely, the annual precipitation of Iran has decreased about 2.5 mm during the 1982- 2012.

Generally, the results indicated that the trend of CWD index in some regions was negative, in some regions was positive and in some other regions there wasn't any trend in the index during the 1982- 2012. Among all the studied stations, the CWD index had positive trend for 11 stations including Kashan, Semnan, Ramsar, Mehr Abad, Dooshan Tapeh, Zahedan, Khorram Abad, eastern Isfahan, Anzali and Abadeh. There was no trend in Arak, Bandar Lengeh and Shahrood stations and negative trend was observed in other stations. According to the results, the CDD index was increasing in most of the studied stations during the period 1982- 2012. Approximately, in 72.5% of the stations the index was raising and in 27.5% of stations it showed decreasing trend. The trends showed that the number of days without precipitation is increasing. The greatest changes have been observed on the coast of the Caspian Sea and the Persian Gulf. The results showed that the indices of R 10 mm, R 20mm, and R 25 mm, at most of the stations have been decreased and R 10 mm index had more negative trend.

The trends indicated that the number of days without precipitation is increasing. Among the studied stations, Ramsar station has experienced the highest downward slope of R95p index with 6.4 mm, annually. From this point of view, Saghez, Rasht, Sanandaj and Bandar Abas stations had the highest downward slope in very wet days. Moreover, Gorgan station with 2.7 mm has experienced the most increasing trend among all stations annually and Shiraz, Esfahan and Chabahar with higher than one mm are in the next rank.

Conclusion

The results indicated that all Precipitation Extreme Indices has been changed over Iran during the 1982-2012. There were negative trends in more stations. In most of the studied stations, annual rainfall has decreased and the number of dry days (CDD) has increased. Only a few stations in the central regions and the foothills of the Zagros have had positive trend.

Keywords: *climate change, extreme indices, Iran, precipitation, trend.*