Assessment of the tracks of spatio-temporal precipitation, Iran

Mahmoud Ahmadi *
Assistant Professor of Earth Sciences, Shahid Beheshti University, Iran
Abbasali Dadashi
Ph.D. Candidate in Urban Climatology, Earth Sciences, Shahid Beheshti University, Iran

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Extended Abstract

Introduction

Rainfall is a fundamental meteorological element that directly or indirectly affected human life. In many climatic studies, it is necessary to make reviews and analyses of suitable temporal and spatial resolution data in atmosphere based on detailed monitoring. There is also the need for resources and authoritative database. Today, with the emergence of the phenomenon of climate change and its consequences and the need to study all aspects of climate, these kinds of data especially in recent decades has been more needed. On the other hand, since spatial patterns of rainfall in short-term time scale was often too heterogeneous, it is essential to achieve a suitable method for estimating large regional rainfall in large areas.

Materials and Methods

To assess the temporal and spatial behavior of precipitation in Iran during last two decades, we used the Aphrodite pixel database. The base period of spatial data with spatial resolution of the Middle East and the period from 01/01/1988 to 31/12/2007 AD by pixel size value 25.0×25.0 arc were taken. To assess spatial autocorrelation data during last two decades we applied the spatial autocorrelation of Global Moran Method. In this study, we also used cluster analysis and outlier analysis (Anselin Local Moran's I) and also applied hot spot analysis (Getis-OrdGi*) to study the temporal and spatial changes in precipitation patterns.

Results and Discussion

The global Moran index for all four seasons of two periods of study is more than 0.75. Based on global Moran index, rainfall in the country in two decades of study indicates a cluster pattern of up to 95 and 99 percent confidence level. Due to the high value of Z and low value of Probability the hypothesis of no spatial autocorrelation between data during two periods is not verified. In most parts of the country (43.78%), there was not any type of patterns. Then, the lack of spatial autocorrelation during second period caused increase in the amount of area equal to 5.88 percent. The areas with no spatial autocorrelation in the summer reached maximum value, and it was in the first and second period equal to 90.88% and consequently 92.36%. In other seasons, spring and autumn, there were also the areas with no spatial autocorrelation

* E-mail: ma_ahmadi@sbu.ac.ir Tel: +98 9121487497

pattern and is allocated relatively half of the country. The amounts of spatial autocorrelation for rainfall data in spring were negative during the first period and it decreased relative to the second period of 1.53 percent. This decrease is mostly found in Northern Khorasan and Central Zagras. There was a low-LL cluster at any of a two periods of study in the summer. The cluster of low (LL) in the autumn of the second period (25.30%) is compared with the first period (28.01 %) changed small value (2.71). However, it changed significantly in terms of location and the center of low precipitation patterns displaced toward east and southeast regions of Iran. The patterns of negative spatial autocorrelation in winter, autumn and spring show changes in spatial and temporal dimension. Then, most of the decline in the two decades of study is associated with the second period in winter season with a numerical reduction (6.62%) compared to the first period (31.30%). It is worth mentioning that most of the reduction is allocated to Zagros region, South East Iran and Northern Khorasan. In general it can be concluded that local factors and general atmospheric circulation systems in the first and second stages affected distribution of precipitation patterns in Iran.

Conclusion

The results showed that long-term rainfall patterns are formed over a period of interaction of local factors and elements of atmospheric circulation. The geographical feature of precipitation patterns are based on local factors, especially latitude and topography. However, we should not ignore the role of external factors in the formation of rainfall patterns because the external factors like general atmospheric circulation play a significant role in the precipitation regime and spatial and temporal changes of precipitation. If we pay attention to cluster rainfall map of Iran we can conclude that the cluster of high rainfall and low precipitation are not similar to each other due to the effect of the general atmospheric circulation patterns. In general, we can conclude that the precipitation patterns are affected and controlled by two main factors, which include: (1) local factors controlling the location (geographic feature of precipitation patterns) and (2) external factors controlling time (regime of precipitation patterns). Finally, this study could be a model for other studies of climatic parameters by a general comparison of precipitation patterns of pixel based data of Aphrodite compared with measured values in climatology and synoptic stations. In all the studies in general and in other fields of study for example ecology and environmental sciences in particular which require updated and accurate climatic data in terms of time and space, we can use Aphrodite data.

Keywords: Aphrodite, Iran, precipitation, spatial autocorrelation.