Assessing the autocorrelation of spatial-temporal temperature change in heat islands of Khorasan Razavi Province

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1. Introduction

The long-term result of cooperation between environmental factors and circulation patterns determines the arrangement of type and manner in temperature heat islands in geographical areas. The knowledge about space dispersion in geographical areas provides the grounds for sound programming and proper environmental decision making. The information about time and place distribution of temperature is necessary to determine energy balance of earth, meteorology studies, and Eva transpiration; in fact, this is the reason why researchers approve of temperature studies. However, traditional trends of statistics have not clearly shown this fact. In environmental studies, we are dealing with observations which are interdependent; the dependence relates to the position and setting of the observations in the studied atmosphere. Thus, traditional trends of statistics should not be used in this type of observations because this kind of data has an interdependent structure in time and place. Therefore, this kind of data is called 'spatial data' in environmental studies and their studies need a normal approach to deal with the action of the data in time and place.

2. Study area

This study is carried out to identify the spatial-temporal autocorrelation of temperature heat islands of Khorasan Razavi Province.

3. Material and methods

To reach the expressed goal of the study, the station of networking data of maximum and minimum temperature of Khorasan Razavi Province was established. The data homogeneity of the stations' temperature with the Kolmogorov-Smirnov Test was applied to SPSS software and their homogeneity was also confirmed. Then, from the data of the station a statistical period of 30 years in a daily period from 1980/1/1 until 2010/12/31 is used as the base of the present research and a network in range of 15×15 kilometers have been spread over the location under study. In reviewing the changes of temperature heat islands of Khorasan Razavi Province during a year, modern spatial

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statistics methods such as Spatial Auto Correlation Global Moran, Local Insulin Moral Index and Hotspots (through GIS) and Matlab were used.

4. Results and discussion

The conclusions showed that Global Moran Index for each of 12 month of the year is more than 0.98 while it is one for the four months of August, September, October, and November. This point indicates that temperature in Khorasan Razavi Province based on Global Moran within the period of the study has the cluster pattern as high of 95 and 99 percent; however, the highest index of Global Moran was in August with the scale of 1/006052. The Z statistics estimated for each 12 month of the study ranges between 98 and 99. According to Global Moran, it can thus be concluded that Khorasan Razavi Province follows a very high cluster pattern during the year. To assess the autocorrelation of spatial temperature change in heat islands of Khorasan Razavi Province, the local Moran island index along with the analysis of hotspots were used. According to the both indicators, the southwest areas such as Ferdows and Boshruyeh stations and northeast areas such as Tabas station play a significant role in forming the heat islands patterns with high cluster. As such, the areas of Khorasan Razavi under study have positive spatial autocorrelation. This occurs while regions have negative spatial autocorrelation. In other words, Cold Island in 12 month of a year is limited to the high regions. On the whole, a significant area of the province in all 12 months of the study lacks significant or disciplined pattern. In fact, they statistically lack sound virtual spatial autocorrelation. The results of this research showed the islands are formed over long periods of time under local and distributional elements playing different roles.

5. Conclusion

Generally, the geographical arrangement of heat islands is formed by regional factors, especially heights, latitude. In this way, the formation, structure and the role of latitude can be traced. However, we should not ignore the role of external factors in formation of heat islands because external factors including the general circulation atmosphere elements play a significant role in determining heat regime and temperature lapse. If we look at the temperature cluster of Khorasan Razavi Province, we see that the clusters in high and low levels are not the same. This contrast is due to the influence of circulation element factors. Therefore, generally we can say that heat islands are created and controlled by two systems, namely 1) Regional factors controlling the region (geographical arrangement of heat islands) and 2) external factors controlling the time (heat island regime).

Key words: Heat islands, Spatial autocorrelation, Moran index, Hotspot index, Khorasan Razavi Province.

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