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Climate change and Global Warming; Causes, Evidence and Effects in Local Scale

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ABSTRACT

The purpose of this study is to study the probable deviation of temperature and precipitation elements in the northwest of the country from normal. For this purpose, at first, the time series of the minimum temperature and the monthly precipitation of the selected synoptic meteorological stations of the region for the past half century (1956-2005) were collected and adjusted. The statistical deficiencies of some series were corrected by the double mass method, in order to investigate and recognize the changes of the time series The Kendall test and the Mann-Kendall statistical-graphic statistical test were used and the type and time of the change of data were determined. The results of the research show that assuming randomness of the data It is strongly rejected and the trend situation is dominant on the data. Based on the graphic diagrams, changes in the parameters u and u mean minimum temperature and rainfall in the region over the past half century have been changed. These changes are short-term fluctuations and trend. This is most evident in most time series since the 1990s. In terms of the distribution of time and location of major precipitation in the region, especially in the east and west of Lake Urmia, sudden changes and significant mutation And during the 1990s and 2000s, the steep slope was on the downside of the medium-temperature minimum and precipitate series. In terms of the average temperature, there is a minimal contrast between the west and east of the region. Thus, in the west of Lake Urmia mutations and sudden changes are significant in the negative direction. But in the eastern lake (Tabriz), a significant temperature mutation in most of the months of the year is a positive one, which is likely to be a recent phenomenon of recent urbanization in this regional contradiction. In northern and southern parts of the region, no significant changes were observed in terms of temperature and the normal state was observed.

Key words:

temperature and precipitation, climate change, I-Kendall, northwest of Iran

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1. INTRODUCTION

One of the issues of many scientific circles in the world is the climate and its transformation as an irreversible condition that has been the focus of most scholarly scholars over the last few decades. A slight fraction of the global climate equilibrium has caused the average temperature of the earth to show a tendency to increase (IPCC; 2001a). As the Intergovernmental Panel on Climate Change reported in 2001 that the changing climate and global warming (Dracoup and Wikinews, 2005). This phenomenon is due to increased concentrations of greenhouse gases in the atmosphere (Dottinger et al., 2004). Many of the natural disasters that are directly and indirectly related to climate change are justifiable. According to the results of climate change studies in the Mediterranean, there is a relationship between the reduction of temperature and precipitation and water shortages and the increased risk of forest fires in the region (Painle et al., 1998). In general, two parametric statistical methods And nonparametric methods are presented to investigate the existence or absence of trend and analysis of time series and climate change, which nonparametric methods have a relatively larger and more significant application (Tokyo and Ishidiari, 2003). Parametric methods based on a regression relationship between the data series and time, Student's t test is one of the most common nonparametric methods. However, it is more appropriate to use nonparametric methods for series with a certain statistical distribution that is not suitable for them and it has a high degree of sloping or elongation. (Bichrthat and Marmite,. 2003). The process of temperature and precipitation is not the same throughout the world. Climate change does not necessarily mean a change in rainfall and temperature (Clark, 2003). On the other hand, proving the existence of a significant trend in a time series of rainfall alone cannot be a decisive factor in the occurrence of climate change in a Region, but it reinforces the presumption of its occurrence (Cirano et al., 1999). Therefore, considering the importance of the issue, the study of the status of the climatic elements of the station in Urumieh has a special place and the recognition of the time-series behavior Temperature and precipitation, and the discovery of possible changes in it, are also inevitable due to the reliable and common statistical methods in the world's scientific circles. Therefore, the purpose of this study is to identify the time series behavior of temperature and precipitation of Urumieh station in order to provide a clear picture of behavioral changes Data and the type and timing of

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possible changes to it, because without being aware of the present and future climate, managers and planners will not be able to implement different programs.

2. METHODOLOGY

World literature on climate change has been widely studied. Most studies have focused on the analysis and analysis of long-term temperature and precipitation behavior and their variations in different regions in relation to the trend of global and regional average temperature rise. Parametric and nonparametric statistical methods, especially the Man-Kendall method have been used frequently. (Lehtmeyer et al., 1994, North and Kim, 1995, Kortizal et al., 1998, Selhie and Kinz, 2004, Peakartha et al., 2004, Zvieres & Sturk, 2004, et al., 2005, Torchi & Erkan, 2005, Mir Et al., 2006, Wolf Mir and others Weller, 2006, Overland et al., 2006, Djankh et al., 2006 and. (2006 Marengo and Camargo (2008) from a long-term review of the maximum and minimum temperature of South Brazilian stations concluded that the temperature trend was a minimum gradient increase, but the maximum temperature trend had a slight slope. Among the in-house studies on the study of climate change by parametric methods And nonparametric works of Boroujerdi et al. (2005), Tabatabai and Hosseini (1382, Rahimzadeh et al. (2004), Kaviani and Asakereh (2003), Zahedi et al. (2007), both Hedeh and et al Aran ((1387 and it is noteworthy. Aziz and Roshani (2008), after analyzing the temperature and precipitation of stations in the southern coast of the Caspian Sea during the 40-year period (1994-1999), used the Man-Kendall method to investigate the probable deviation and identify the changes in the data and its type and time. It was concluded that the onset of most of the sudden changes was due to both trends and fluctuations. In addition, at most stations, the temperature of the minimum positive trend and the maximum temperature were negative. In this paper it is considering the importance of the phenomenon of climate change. Northwest of Iran in the vicinity of the countries of Iraq, Turkey, Azerbaijan and Armenia is one of the most important hubs of Iranian population and agriculture. In terms of overall climatic divisions, the climatic characteristics of the region are part of the semi-arid climatic zone, which is almost dry in summer and the rest of the seasons are wet. The average annual precipitation during the 50 year period is 323 (1956-2005 mm and the average annual temperature is 11.8 ° C). As in figure 1, an important part of the rainfalls is solid and snow. The average January temperature is the coldest month below zero degrees Celsius. The main feature

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of the monthly rainfall is its instability from year to year. Monthly rainfall change coefficient is not less than 41% in any fish. The most seasonal precipitation is calculated in spring. The summer share of annual rainfall is very small (less than 5%), and the reliability and stability of summer rainfall is very low. In climate change studies, long-term statistics can reveal significant changes and characteristics. Therefore, the long-term data is the average monthly, seasonal, cold season (October, November-December-January-February-March) and warm (April-May-June-July-August-September) and annual and total monthly precipitation, seasonal (June-December-January-February-March-April) and dry periods (May-June-July-August-September-October) and the yearly selected Synoptic Meteorological Station of the region during the 50-year statistical period (1956) -2005 was obtained from the website of the State Meteorological Organization Spatial Distribution.

3. RESULTS

In general, after drawing and visual inspection of the frequency distribution diagrams of temperature and precipitation data, it was deduced that, with the exception of summer rainfall data, the graph of the rest of the series was almost similar to the normal distribution diagram. One of the basic assumptions in most statistical computations is the randomness of observations, and the deviation from the assumption of randomness can be due to a linear gradual change (incremental or decreasing trend), a sudden change, the existence of periodic behaviors or increased variability, time fluctuations, and some other causes. (Shahabfar et al., 2003). It is evident that the results from the Kendall test statistic show that the zero assumption (randomness of data) is strongly rejected as in figure 2. Therefore, the probability of a trend in the series was in power. Furthermore, the rule of intensity and weaknesses the trend of the time series of temperature and precipitation for the North and East (Khoy and Tabriz) and South and West (turpentine and Urmia) is almost the same. The first step in examining the relationship between the two changes in the distribution of the distribution chart or the graph of the variation of the values of these two variables is in relation to each other. Therefore, to analyze the correlation between cluster series with time variable, the data distribution chart was investigated. The results of the visual review indicated that there was no linear relationship between the time-varying pairs of temperature, precipitation, and time, because the dispersion of the points in the dispersion graph was very high, and

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the link between the variables was very weak at the time. As it is evident from the changes, the changes in the parameters of u and u in the annual rainfall of two stations in Tabriz and Khoy outside the critical range of 1.96 were cut off in 2001, 2003 and 2005. This situation indicates a significant change in the annual precipitation data. In sum, the results of the study of the variation curves of u and u 'related to the rainfall in the study area show that during the last half century, the annual rainfall of the east and north of the region in the early 21st century has changed dramatically and has a significant mutation. It seems that the widespread urbanization in the last three decades has not been ineffective in the local climate. But the annual precipitation in the western part (Urumia) and in the south (Saghez) of the region is unchanged and continues to be normal, and only a few mutations in the 90s are visible within the confidence band. In terms of seasonal variations, it can be concluded that the winter rainfall in the east and west of Urmia Lake in the two decades leading to the time series suffered sharp changes, especially during 2002-2005, significant mutations with negative trend governance. The spring rainfall of Saqez stations in 2002 and 2005 and Tabriz in 1990 has a negative mutation and abrupt changes with the sovereignty. On a monthly scale and in terms of the distribution of time and space, the monthly rainfall of September has suffered abrupt changes and significant mutations in almost all stations in the region in the 1990s and 2000s. From the study of the behavior of changes in the parameters of the u and u diagrams related to the average temperature of the region over the past half century, it was concluded that in the east and west of Lake Urmia, there were two completely opposite conditions for all months of the year. In terms of spatial and temporal distribution, the average temperature variation in the west of the region (Urumieh station) has undergone a sudden negative change during the 1990s and in some months of the first decade of 2000, and the trend is significant. But this situation for the eastern lake (Tabriz station) is quite contrary to Urmia. Thus, the significant mutation of the average temperature is at least the most favorable month of the year in these two decades. On a seasonal scale, there is also a sharp regional conflict. This means that, in addition to the eastern region, the average temperature of the spring and summer of the northern and southern parts of the country, especially in the mid-2000s, has undergone significant changes with positive trend. From the point of view of the temporal and spatial scale of the hot and cold periods, it was concluded that, with the

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exception of the western part of the study area, the predominant regions of the temperature increase trend show that the average temperature increase was steep in the late 1990s to the first half of 2005 In the meantime, there have been several significant positive mutations, particularly in 1996, 1998, 2001, and 2005. As indicated by the average annual temperature charts of the selected stations in the northwest region of Iran (Fig. 5, north and south of Lake Urmia, without mutation, and a significant change in the natural process, the average temperate temperature has been experienced, but this situation is completely different for the west and east of the region In the west of the region (Urumieh), a sudden change occurred in 1993, and its trend is negative, but in the east of the region (Tabriz) there are several significant leaps with the ruler. In general, after collecting data on the mean of minimum temperature and precipitation of selected stations in the study area during the period of 1956-2005, in order to investigate the changes in the series, the Kendall test statistics for all months, seasons and periods are calculated and calculated. The diagrams of the changes of the components u and u respectively were drawn and the following results were obtained: over the past half century, the annual rainfall of the east and north of the region under study in the early 21st century was a sudden change the find is significant as in figure 3. However, the annual rainfall in the western part (Urumia) and the south (Saghez) of the region is unchanged and continues its normal course. North and South of Lake Urmia are without a mutation and a significant change in the natural process of the average minimum temperature. This situation is completely different for the west and east of the region. In the west of the region (Urumia), a sudden change occurred in 1993, and the sovereignty of the process is negative. But in the east of the region (Tabriz) several significant leaps have occurred with positive trend rule, especially in 1996, 2001, and 2005, and the process of changes in the u diagram also shows a steep increase in the average minimum temperature in this section.

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Fig.1. Study area

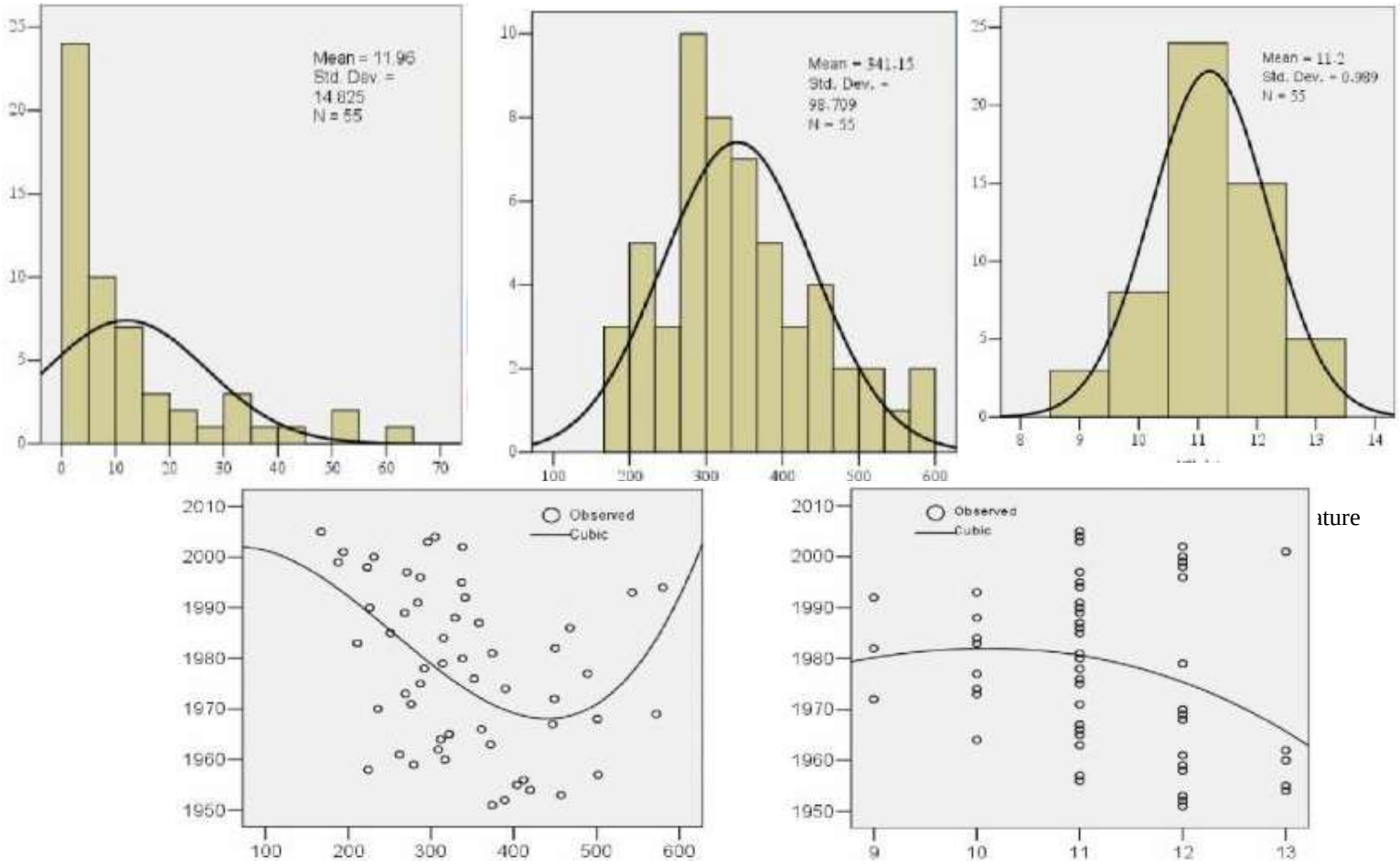

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Fig.2. Distribution chart of temperature and rainfall data and summer precipitation along with normal curve graph.

Fig.3.Chart changes in temperature and precipitation values along with the curve diagram of the third-order linear equation.

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Rainfall Temperature