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Climate Change and Global warming overview; Assessing Climate Change and Global Warming in local scale

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ABSTRACT

The purpose of this research is to identify climate change in Iran. For the purpose of this research, daily precipitation data, temperature (day and night) (1437 synchronic, climatic and rain gauging stations) were used during the period from 16/9/1966 to 16/9/2016. The data were interpolated using the Kriging interpolation method in cells of 15 × 15 2 km, and a matrix was created in the size of 15706 × 7187 days that was placed on the rows of the day and placed on the columns of the cells. With the help of the 27 Climate Change Indicators introduced by the Climate Change Identification and Climate Change Expert Team 3, a study was conducted to explore the climate change in Iran. The results of this study showed that the 4 (g) SU of summer days (SU25), hot days (TX90p), hot nights (TN90p) and night nights (TR20) are increasing during the study period. While the cold-frost indexes trend, including freezing days (FD), ice days (ID), cold nights (TN10p) and cold days (TX10p), are down and decreasing. It has been prolonged and, conversely, cold waves have become shorter. Increasing the nightly temperature rate compared to the daily temperature has led to a decrease in the temperature range of the night. Also, the results of this study showed that the frequency of rainfall is increasing.

Keywords: Climate change, Frost indexes, Trend, Iran

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1. INTRODUCTION

Today, the phenomenon of climate change and global warming has attracted the attention of all thinkers and researchers. Increasing the period of growth, increasing the temperature and melting of Arctic ice and increasing the level of water, decreasing precipitation and droughts, and increasing the incidence of flood, heat waves and decreasing cold waves as signs of climate change have caused many economic and social problems. In recent years, the intensity of the change has increased and this has led to several studies in the field of climate change in different parts of the world. Some of these studies have sought to find out the reason for its occurrence, and some of which are limited to the study of climate change. According to Cathoffs et al. (1999), the reason for climate change is the increased use of fossil fuels, urbanization, forestry and desertification. [9] Ebrahimi et al. (2005) Changes in temperature in Mashhad Plain as a Climate Change Index in the region. The results of this research show that the increasing temperature trend is especially pronounced for the minimum temperature, and the statistical results show that in most months the temperature trend is incremental and at the end they came to the conclusion that temperature variations can be viewed as an indication of changing the climate. [1] Ghorbanizade Kharazi et al. (2009) The effect of climate change on the time distribution of runoff from snow melt in the Karoon area. The results of their research showed that maximum flow time will be transmitted from spring to winter. [15] Alizadeh and Kamali (2002) The effects of climate change on increasing agricultural water consumption in Mashhad plain. The results of these researchers showed that if 2 ° C of air temperature increased, the requirement for pure irrigation with pattern and combination of current culture would increase 6% compared to normal condition. Based on their findings, the increase in irrigation requirement for 4 and 6 degrees of temperature increase was estimated to be 11 and 17 percent respectively [3]. Azizi et al., 2008). Using multivariate statistical analyzes, they retrieved climate change in the western half of the country. The results showed that in different stations, proximity to large cities and relative geographical position has been effective in the process of change. Also, based on the obtained results, moisture and precipitation data are not much affected by the trend. [5] Azizi and Roshani (2008) study the climate change on the southern shores of the Caspian Sea using the Man-Kendall studied. The results indicate that in most of the plants, minimum temperature,

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positive trend and maximum temperature show a negative trend and the range of temperature fluctuations has decreased during the course and the percentage change in winter and summer is more than spring and autumn [6].] Khalili Aghdam and Soltani (2009) studied the climate change in Urumia over the past 50 years. The results showed that the average rainfall during the last 50 years in Urmia did not change significantly. Global warming and global climate change have led to an increase in the temperature in the area. [18] Babaian et al. (2009), with the help of the microscale of the data of the ECHO_G atmosphere circulation model, during the period of 2010-2039, assessed the climate change in Iran. The results showed that during the period from 2010 to 2039, precipitation on Iran would decrease by 9%, the thresholds for heavy and heavy precipitation increases by 13 and 39%, and the mean annual temperature will increase by about 0-5 ° C Had The cold months of the year will experience the most monthly temperature increase compared to other months of the year. [7] Pine et al. (2002), using the RCM model, to investigate climate change in the Columbia River Basin they studied. Their study period was from 2040 to 2060. Their findings showed that climate change would result in an increase of 1.2 degrees Celsius of air temperature and precipitation would fall by 3 percent. Also, for the basins, predicted increased winter runoff and reduced it in other seasons. [21] Geun et al. (2016) studied the effects of climate change on increasing the sea level of the lake in the years from 2070 to 2100. The results showed that due to global climate change and global warming, lake water level up to 50 cm for period The future will increase. [16] [Rydrygordiz and colleagues]) 2007 the effects of climate change on the need for irrigation water in the Giudat-Al-Kivi River Basin region. The results of their study indicated an increase in drought and water demand for irrigation. Modeling of irrigation requirement showed that the irrigation water demand during the period 2070-2070 depending on the location and pattern The cultivation will increase by about 15 to 20 percent. [23] Freys et al. (2009) examined the role of climate change in Mediterranean crop production. The results indicate that wheat yield reduces for the next century, as its negative effects begin with low latitudes and with increasing latitudes, the role of climate change on wheat yield increases [13] By reviewing the resources and researches on climate change in Iran, we can conclude that there has not been a complete and comprehensive study on Iran's climate change curriculum. The research has either done at a point (station) or

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regional or full indexes of climate change measurements have not been thoroughly investigated. Using the 27 profiles proposed by the Climate Change Identifiers and Profiles, To measure climate change on the Iranian border as a study unit. To do this, we use high-resolution (15 × 15 km) resolution network data and daily time resolution.

2. METHODOLOGY

For the purpose of this research daily rainfall data, minimum daily (and maximum) daily temperature (on 1437 synchronic, climatic and rainbow stations were used during the period 1966 to 2016). In this There is no doubt that the distribution of the most important amounts of atmospheric, temperature and precipitation parameters is equivalent to Iran's land and Uniform and different regions may not have the same effect on global warming and climate change. As the findings of the Mas'udiyyah are, they are (2016) and show the partners (2015). The velocity rate of atmospheric measurements in the form of temperature and precipitation indexes in different regions of Iran is not the same and the same. In some areas) are limited in scope (even the type of trend is not in harmony with other areas. 10 [20] However, when speaking of a basin or area, there are many questions in the mind of the researcher Which needs to be addressed in order to respond to them. We need to consider the basin or area in question as a unit. For example, in reports provided by the Intergovernmental Panel on Climate Change, when referring to the Verdiani of the Farin Climatic Indexes, the entire Earth is considered as a unit of study, apart from the spatial differences. -2100, mean temperature of the earth's surface is 1.1 to 4.6 The degree of centigrade will increase. [8] But the point is that a simple averaging of spatial data is allowed when the data is uniformly distributed over the area concerned. If the data does not have a homogeneous distribution over the place, the average is not calculated for the exact area, and the average for the regions (location), which has more data, will tend to be. [2] In a study by Frych et al. (2002), problems associated with the use of station data with distribution Uniformity in assessments and understanding of climate change. [14] Using the Kriging statistics method, daily data was interpolated on 15 x 15 km networks. On the basis of the spatial separation mentioned above, 7187 spatial cells are located in the Iranian political frontier. The database was created in the dimensions of 15,706 × 7,187, placed on rows per day and on the columns of the cells (networks). For each of the three measurements of 1, a separate database was created. Then, the average of 7187 cells

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were calculated for each day in order to determine the extent of Iran's land as a unit of study. Finally, a database was created in the size of 15706 × 3, with the mean of precipitation, the minimum and maximum daily temperatures set on the columns. With the help of daily data, the indexes were calculated in each of the different years of the statistical period (2016-2005). Different profiles have been introduced and presented by individuals and research institutes for the study of climate change in the world. Each of the introduced indexes has its own disadvantages and advantages. In general, many features important indexes analysis of climate change must-have is a (together very dependent not, and any information independent of climate change express, B (indexed addition to the ability to compare different parts of the world together Should be based on regional conditions and have the possibility of comparing different areas; and c) in addition to the above, the new indexes should have the ability to measure climate change on a time scale and spatial scale. In this study, 27 indicators of temperature and precipitation parameters were proposed by climate change experts and indexes experts to identify and evaluate climate change. In these proposed indexes, all the features necessary for climate change indexes are seen, and often show the aspects and characteristics of the temperature and precipitation precipitations, including incidence, severity and durability. Of the 27 proposed or proposed profiles, 16 are indexes of temperature curves and 11 indexes related to rainfall. This profile can be classified in five groups: [2] (a) (Percentile indexes: These indexes include the occurrence of cold nights TN10p, warm nights TN90p, cold days TX10p, hot days TX90p, many days Wet R95p and very wet days R99p. The percentile-based temperature indices select the hottest and coolest defiles for the minimum and maximum temperatures, so that they can judge which stage is changing.

3. RESULTS

The rate and slope of the variation, the standard deviation of the slope value with Value-P, is given in Table 3. The average annual number of frost days (FD) in Iran is about 32 days a year. As is evident, the frequency of the incidence of this index is decreasing, and in particular, since 1992 and 1993, its declining rate has intensified. At 99% confidence level, this index is meaningful and generally decreases by about 3.5 days per decade and the standard deviation of the slope is about 1.8 days per ten years. In other words, the decrease in the number of freezing days during each decade is 8.1 ± 3.5 days

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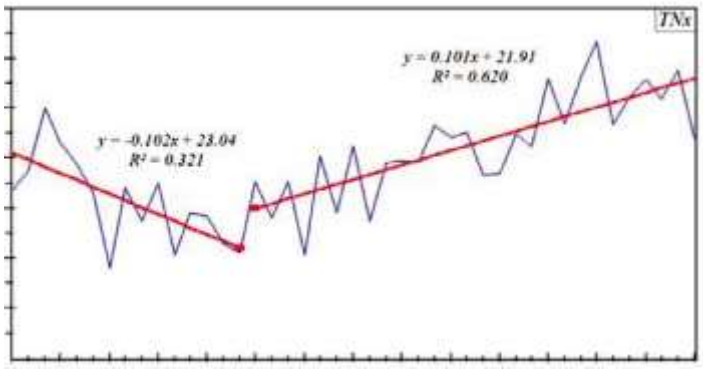
(Table 3). The number of summer days (SU25) shows a positive and significant trend during the study period. In other words, the number of days that has been recorded above 25 ° C in Iran has increased. In 2001, the frequency of this profile reached 217 days. The incremental slope of this index is statistically significant at 95% confidence level, and in general, about 3 days during each decade, the number of summer days has increased and the standard deviation is 1 day per ten years. The average occurrence of ice days (ID) of Iran is zero and has not shown any trend during the studied years. The trend of number of nights (TR20) during the studied period shows two periods with a completely different trend. From 1966 to 1976, the incidence rate of this index has been declining, but its slope has not been statistically significant at 90% confidence level, but since 1977, with a very steep incidence, the incidence of the number The nights of Iran show a positive and significant trend at a confidence level of 99%. The incremental rate for this index is about 5.7 days per decade. The growth period (GSL), which is one of the most effective agricultural indexes in Iran, is increasing during the studied period. In general, it has increased by 3.4 days for every decade. The incremental trend of this index is significant at 95% confidence level. The highest maximum temperature (TXx) in Iran has increased and the incremental slope of this index is statistically significant at a confidence level of 99%. The trend rate for this index is 23.2 ° C for ten years, with a standard deviation of very low trend rates of 0.08 ° C per decade. The lowest maximum temperature (TXn) is also increasing, as in the previous index, but the incremental trend of this index is not statistically significant. Figures. 1&2. Iranian temperature indexes during the period from 1966 to 2016.



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20 1966-2016

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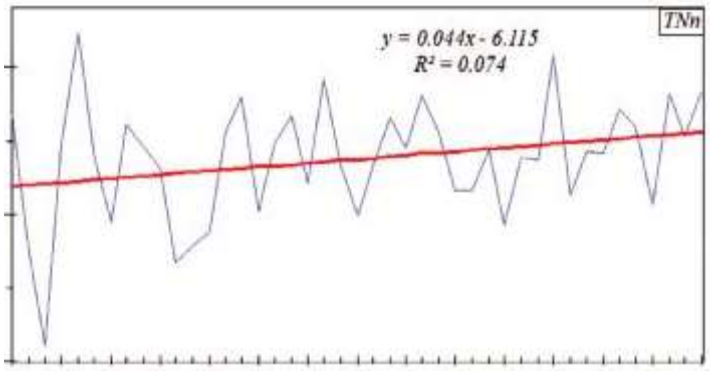

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1966-2016

The highest rainfall in one day (RX1day) in Iran is increasing. In other words, the intensity of rainfall is more than one day long. The incremental rate of this index is 0.67 mm and the standard deviation of the trend rate is 0.22 mm per decade. At 99% confidence level, this index is significant. The maximum amount of five-day precipitation (RX5day) is also increasing, with an incremental rate of 1.1 mm per decade, but not statistically significant. The daily rainfall intensity index (SDII) shows a positive and significant trend. The incremental rate for this index is 0.11 mm per decade or 1 mm per cent. In 2016, the intensity of the daily precipitation peaked at about 7.7 millimeters a day. The number of days with heavy rainfall (R10) is increasing in recent years. In other words, the frequency of the occurrence of rainy weather in Iran (Iran's average rainfall) (the mean of Iran's earth, which was at least 10 mm, has increased and is statistically significant at the level of confidence of 99% its slope) (R20 and R25) They do not show up. Of course, this does not mean that there is no trend in Iran at any point in the land, which may increase the number of days with heavy rainfall in some areas. But the average total rainfall of one day during which Iran lands (7,187 cells) received at least 20 or 25 millimeters does not show a trend. The dry days of the day (CDD) show two relatively different trends during the studied period. From 1966 to 1983, the process of this negative index was severe, which is statistically lowered significantly. From 1984 to 2016, the trend is still negative, but not statistically significant. The wet succession days (CWD) show two completely different trends during the study period. Between 1966 and 1996, the trend is positive, with a 90% increase in the incidence rate, but from 1997 to 2016 the trend is negative, with a slope

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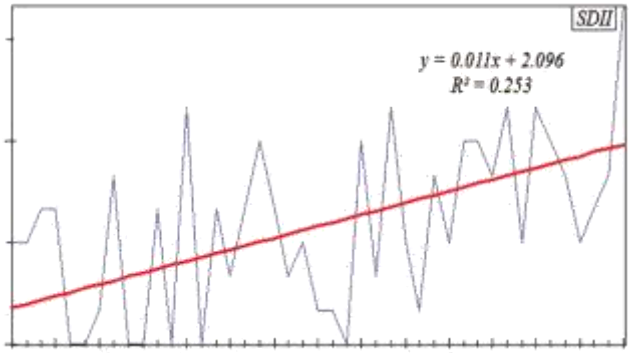
rate of about 1.5 days per decade, which is statistically significant. Very wet days (R95p) show a positive and significant trend during the study period. The increase in this index is statistically significant at 95% confidence level. The slope rate of this index is 2.5 days, relatively high and equal to 4.2 days per ten years. Very wet days (R99p) are also increasing in Iran, which is statistically significant at 99% confidence level. The slope rate is 3.5 days per decade, which is smaller than the wet days, with a standard deviation of 3.1 days in ten years. The total rainfall of wet days (PRCPTOT) during the studied period shows two relatively different trends. Figures. 3&4. Iranian Precipitation indexes during the period from 1966 to 2016.



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2 1966-2016

1966-2016

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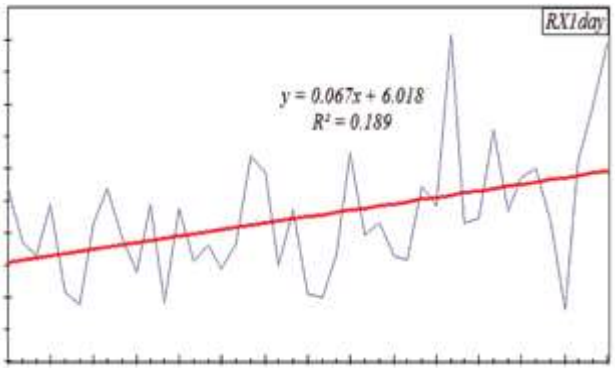

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1966-2016

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