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Changes in Temperature and Precipitation with the Analysis of Geomorphic Basin Chaos in Shiraz, Iran

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Abstract: *Applying the logic of chaos in understanding many details of natural phenomena is unexplainable. At this paper, the climate changes of temperature and precipitation over the analysis of chaos in Shiraz geomorphic basin will be discussed. Climate changes of a long-term temperature and precipitation were used for 40 years. Then, geomorphic basin physiognomic characteristics were examined at the most superficial layer and the climatic elements were analyzed. The results of this study suggest that climate change of Shirazbasin geomorphic structure is a function of non-linear algebraic curves.*

Keywords: *Shiraz basin geomorphic, chaos, climate change, temperature, precipitation.*

1. INTRODUCTION

Chaos is a concept that expresses some kind of order in the chaotic process framework. Although it is more a similar fallacy from a philosophical point of view, but shortly after stating the theory it was expanded. The studies of Jones et al. (1986) and Hansen and Lebedev (1987) were the most important researches in this field that various components of last century's temperature were considered according to these characteristics.

Precipitation is one the important climate factor. Today, the issue of climate change increases the temperature, precipitation, floods, droughts, heat waves, melting polar ice, changes in rainfall time and space, disrupting the hydrological balance, and management strategies; because the water resource managers and researchers didn't expect such a severe impact on the climate and hydrology parameters. In the last few decades, Chaos theory is the basis of nonlinear dynamical systems, which has created a great development in the way of understanding and expression of phenomena. This theory examines such a system that at first glance may seem random, but in fact are governed by specific laws. Such systems are called chaotic.

The purpose of this paper is to study the climate changes on geomorphic basin of Shiraz during the last fifty years. It should be noted that the process of climate change and climate variability of Shiraz basin are completely independent of each other.

2. MATERIAL &METHODS

Shiraz geomorphic basin an area of 3931.84 square kilometers, which is located at the 52 degrees 13 minutes and 16 seconds to 53 degrees 28 minutes 59 seconds east longitude and 29 degrees 15 minutes' north latitude and 29 degrees 55 minutes 59 seconds. In choosing the method of determining the climate of Shiraz basin algorithm, a combined method must be used as follows:

A. At early researches, the climate data will be extracted from the National Weather Service by using the library methods. Given that the climate data extracted from synoptic stations in the surrounding area of Shiraz cityin Fars province were settled in the political sphere, that's why the statistics for thirty years at all stations in the surrounding area of Shiraz basin are collected.

B. The information is gathered digitally from the field observations of geomorphological information on Gps to a geographic information system. Using the topographic maps of 1: 50,000 and 1: 250,000, the height and slope of Shiraz geomorphic basin become digital.

C. Then, according to Pythagorean algebraic golden ratio), the climatic characteristics have been analyzed. It should be noted that during the estimation, it isn't necessary to insert exactly the golden ratio changes and climate fluctuations. But what is important is the ratio between output systems. This is because, like the natural logarithm of the ratio or Radian constant, it is an irrational number and acyclic return.

2.1. Problem Statement

The full climatological practices and behaviors are analyzed based on the climate changes and fluctuations. Shiraz geomorphic basin is very important as one of the major poles of population, industry, and agriculture. In other words, agriculture, industry, economy, human development and natural resources in the province, especially Shiraz, are dependent on the weather and hence, volatility and changes play the significant role during the short-term, medium-term and long-term in sustainable development of Shiraz. Because Shiraz geomorphic basin is considered as one of the exceptional and unique Zagros geomorphological Basin, the evaluation of climate changes on Shiraz geomorphic basin in cooperation with independent geomorphic basins is ended to a height of 1550 meters above sea level on Bakhtegan Lake. Human beings, both living and non living, have no control over the developments of dynamic and thermodynamic climates. Although emphasizing on this fact is also quite logical that human activities can cause these changes in the macro-scale, medium and micro affect, but it governs the matter from the physical identity point of view.

2.2. The Temperature Zoning of Shiraz Geomorphic Basin

Having knowledge about the distribution of temperature programming is considered necessary at natural and agricultural sources. According to the spatial distribution of these characteristics in this study geostatistical methods in the study of zoning and spatial distribution of temperature properties were evaluated in Fars province .

The results showed that the evaluated spatial characteristics have followed the Gaussian and spherical models. Among the methods used to estimate, the weighting method was the best way to inverse distance. Northern parts of the province have the lower average long-term temperatures than the southern part, while other parts of central and southern areas, especially west of the province, have more than average temperatures and sunshine hours. Given that geomorphic basin is located in Shiraz, so in order to obtain a more comprehensive conclusion the zoning of Province would have to be taken. As you can see, the North-East province is governed by a traffic temperatures of 17 ° C. on the above map, the location of Shiraz is determined; so, we have to inevitably overlap GIS map of Shiraz basin and then cut it to receive the status of Shiraz basin's temperature. Thermal cutting of Shiraz basin is shown in Figure (1-1).

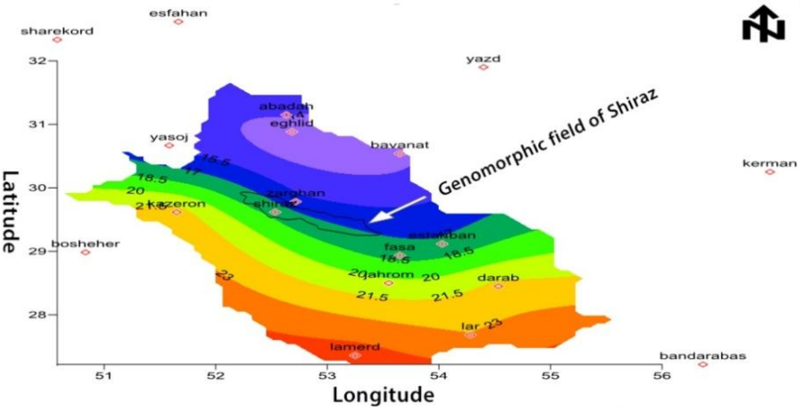

Figure1. *Average long-term mean annual temperature of Fars*

At this data zoning, the area has not been affected by the traffic of thermic. The province in the North-East region is faced with a much traffic the outside traffic intersection is located in Yazd province. So, neither the province nor the Shiraz geomorphic basin traffic is not formed. It should be noted that this is ruled on Shiraz geomorphic basin, while it is also located in the southeastern part of Shiraz geomorphic basin to completely change the heating lines and reverse them.

2.3. Temperature Changes of Shiraz Geomorphic Basin

Temperature is one of the most important factors of Shiraz geomorphic basin. So, we check the status of temperature changes for thirty years in the form of tables (1-1).

A simple mathematical analysis can be used to form a series of temperature changes at Shiraz basin. Figure (1-1) display the changes in temperature of Shiraz station. As the Figure (1-1) shows, the thirty-year radiation and temperature changes are experiencing a chaos. This chaos is visible on the graph, but its process must be analyzed. Another way of understanding the appearance of chaos in ascending charting is the process of temperature changes.

Long-term	Average long-term temperature							Relative monthly humidity			Rainfall(Millimeter)			Evaporation	Sunshine	Day Number	Max wind	
	Min	Max	Average	Day	absolute min	Day	absolute max	Min	Max	Average	amount	number of rainy days	Maxdaily	Millimeter	Time	Frosty	Direction	Speed
Farvardin	8.0	22.1	15.1	8	-1.4	25	31.2	25	71	48	39.6	8	74.2	5.0	8.5	0	257	15
Ordibehesht	13.0	29.1	21.0	7	3.6	28	37.8	17	56	37	13.5	4	44.2	7.8	9.9	0	256	15
Khordad	17.2	35.0	26.1	8	8.0	25	40.6	11	38	25	0.5	0	5.8	10.6	11.8	0	274	13
Tir	20.6	38.1	29.4	11	13.0	19	43.2	11	37	24	0.6	1	15.6	11.2	11.3	0	221	12
Mordad	20.6	27.7	29.2	20	12.4	14	42.0	12	41	26	1.4	1	22.6	10.4	11.0	0	251	13
Shahrivar	16.9	35.1	26.0	25	8.3	6	39.6	12	43	27	0.1	0	2.2	9.0	10.7	0	242	12
Mehr	11.7	29.7	20.7	25	3.0	6	36.2	14	51	32	1.7	1	25.5	6.6	9.8	0	276	12
Aban	6.4	22.7	14.5	25	-5.0	5	29.4	22	66	44	19.7	3	56.9	4.2	8.1	1	262	12
Azar	2.4	16.1	9.3	19	-6.4	6	24.4	33	77	55	65.9	6	100.4	2.5	6.8	7	249	12
Dey	0.7	12.5	6.6	19	-14.4	13	22.4	39	83	61	82.8	9	221.0	2.5	6.7	15	243	11
Bahman	1.1	13.4	7.3	11	-9.6	21	23.5	34	80	57	60.7	9	59.3	2.9	7.3	13	241	13
Esfand	4.4	17.4	10.9	8	-6.8	19	27.4	28	75	51	52.2	9	39.2	4.0	7.7	3	241	14
Sum											338.7	51		76.5	109.5	39		
Avrg	10.3	25.8	18.0		0.4		33.1	21	60	41		4		6.4	9.1	3	251	13
Min					-14.4													
Max							43.2						221.0					

Table1. *Thirty Years Climatic Factors of Synoptic Station in Shiraz. Source of Geological Survey*

To draw these charts, data in Table (1-1) were used. So that all temperatures are then normally arranged in ascending order and line graph will be drawn. In the expression of figure (1-1) must be mentioned that if the temperature changes have a static mode, the pulses must be completely in the same process.

2.4. The Annual Temperature Changes of Shiraz Geomorphic Basin

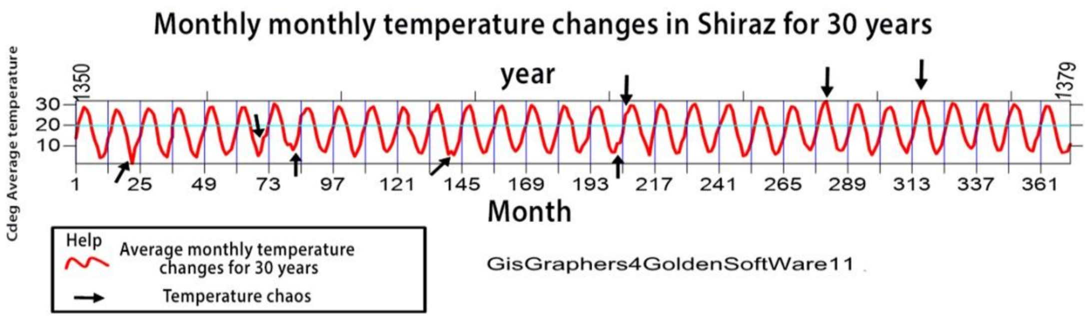

Figure2. *Changes in annual temperature of the geomorphic basin of Shiraz*

In Figure (2-1), the average monthly temperatures have been set in ascending order for Shiraz and then are plotted with the forms of line graph. As the Figure shows that in some parts, the slope failure is significant.

According to the above quantity and the positive trend of 95 percent at long-term average monthly temperature, the thermal imbalance of geomorphic Shiraz is calculated as follows:

$$T = (e^{0.991})M^{0.538}$$

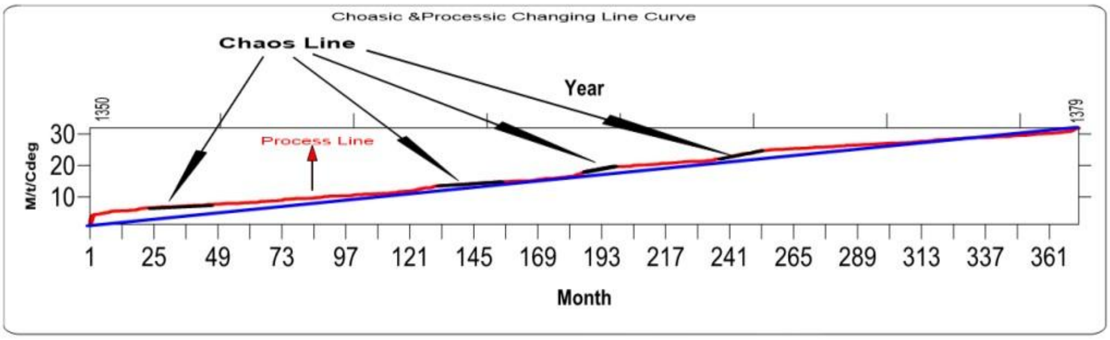

Figure3. *Chart of Trend Linear Changes in the Monthly Temperatures of the Geomorphic Basin of Shiraz for Thirty Years*

With this calculation and very minor differences, for example, the lowest average temperatures in January are not relevant. It is absolutely clear that first up to thirty row temperatures are belonged to January, because the lowest levels are applied to them. To calculate the area of the Kayes temperature of Shiraz geomorphic, we calculate the value of M to the function T:

$$M = (e^{\frac{\ln\left(\frac{t}{2.716}\right)}{0.538}})$$

2.5. The Zoning of Precipitation at Shiraz Geomorphic Basin

Having knowledge about the distribution of temperature programming is considered necessary at natural and agricultural sources. According to the spatial distribution of these characteristics in this study geostatistical methods in the study of zoning and spatial distribution of temperature properties were evaluated in Fars province. With a mean of rainfall data in January, February and March, the seasonal rainfall time series for each station is calculated and then normalized correlation matrix was created between data. In the next stage, the eigenvalues, time series of main components and loading factors were also assessed. The first and second components, which were explained collectively as 68/1% of the total variance, were considered as the principal component and also used for zoning rainfall.

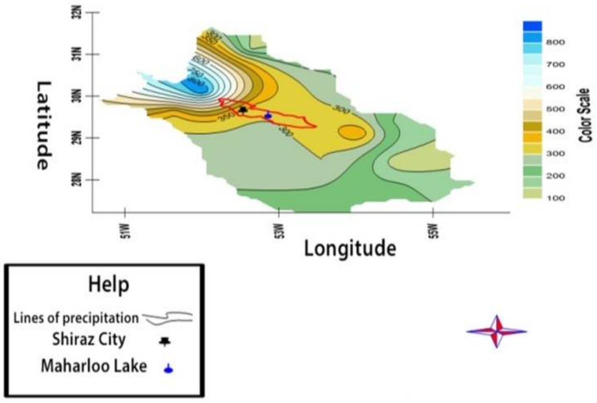

Figure4.*Characteristics of the Chisonic Structure of Changes in Precipitation in the Shiraz Geomorphic Basin in Voxler3 Software*

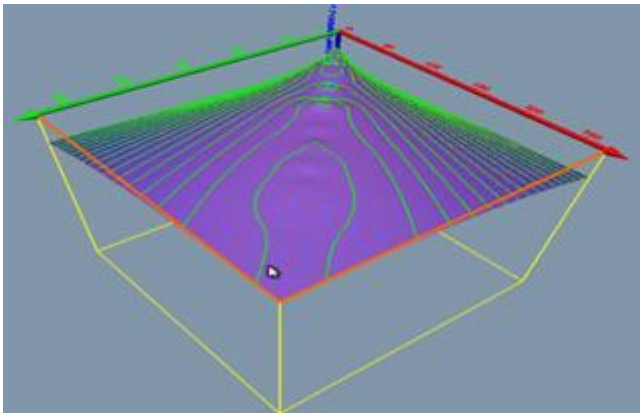

Figure5. *Surface zonation of geomorphic basin of Shiraz compared to other areas of the province*

Vectors corresponding to the second principal loading component showed large amounts for Bavanat in Northern Province. This area was considered as independent regions corresponding to the second component.

3. RESULTS

Shiraz geomorphic basin is very important as one of the major poles of population, industry, and agriculture. In other words, agriculture, industry, economy, human development and natural resources in the province, especially Shiraz, are dependent on the weather and hence, volatility and changes play the significant role during the short-term, medium-term and long-term in sustainable development of Shiraz. It is necessary to require that Shiraz geomorphic basin like any natural basin at ground level is a dynamic basin. The results showed that the evaluated spatial characteristics have followed the Gaussian and spherical models. Among the methods used to estimate, the weighting method was the best way to inverse distance. Northern parts of the province have the lower average long-term temperatures than the southern part, while other parts of central and southern areas, especially west of the province, have more than average temperatures and sunshine hours. The occurrence of some natural elements, especially climatic parameters, is defined outside the functions. As an example, the structures like

$$\Gamma(\mathrm{k}) = \int_0^{\infty} y^{k-1} * exp(-y) dy$$

And

$$Y = \int_{-\infty}^{\infty} .39894228 exp^{\left(-\frac{x^2}{2}\right)}\, dx$$

Shouldn't be used in predictions, because fluctuations and changes express the chaos structure $Y = mX^n$.

At this structure,

$$Y = (1/\int_{\alpha}^{\beta}((mX^n)dx) * \int_{A}^{B}(((mX^n)dx)dx) * 100$$

Is used to calculate the probability of each parameter.

As a result, the return period of

$$T = (1/((1/\int_{\alpha}^{\beta}((mX^n)dx)) * (\int_{A}^{B}((mX^n)dx))))^{-1}$$

Is used to calculate the return period with the domain 1≤X≤(1*10^9)XI.

$$LN(T) = -LN(1/((1/\int_{\alpha}^{\beta}((mX^n)dx)) * (\int_{A}^{B}((mX^n)dx))))^{-1}$$

As a result:

$$-LN(T) = LN(1/((1/\int_{\alpha}^{\beta}((mX^n)dx)) * (\int_{A}^{B}((mX^n)dx))))^{-1}$$

So if the criterion:

$$p = 1/((1/\int_{\alpha}^{\beta}((mX^n)dx)) * (\int_{A}^{B}((mX^n)dx)))$$

Calculates the possibility of structural parameters, then it not necessary to measure the return period, which is considered as 300 years. Having knowledge about the distribution of temperature programming is considered necessary at natural and agricultural sources. According to the spatial distribution of these characteristics in this study geostatistical methods in the study of zoning and spatial distribution of temperature properties were evaluated in Fars province. With a mean of rainfall data in January, February and March, the seasonal rainfall time series for each station is calculated and then normalized correlation matrix was created between data.

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