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The Study on the Geo-Morphism Related Characteristics of Shiraz Geomorphic Basin, Fars Province, Iran

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Abstract: *Generally, hydrologic and geomorphic basins select the basic level of material and energy transmission along geophysical gradient. This is very common and normal. But, if a given basin is not able to direct its basic level of material and energy transmission towards geophysical gradient, it should be taken into account as a very specific case. These kinds of basins are very rare and we can point to Kor and Shiraz geomorphic basins as relevant examples. These two basins share a boundary at eastern part of Shiraz basin. In the current study, geomorphic-related characteristics of Shiraz geomorphic basin are scrutinized. The necessity of analysis of the mentioned issue [1] refers to the point that like other natural basins, Shiraz geomorphic basin is a dynamic one. As a results, it is necessary to have an algorithm ruling geo-climate trend of balanced and sustainable structure of the basin. Study of the geomorphic-related characteristics of Shiraz geomorphic basin has been focused during these thirty years. It is worth noting that climatic changes and fluctuations ruling Shiraz basin are quite separated but they have shared cybernetic composition which states that the resultant of hydro geomorphic structure can represent sustainable and balanced status of that basin. Results should be used to observe behaviors of humans included in Shiraz basin with the help of managers.*

Keywords: *Geo-morphism, Shiraz Geomorphic Basin, Hydrologic*

1. INTRODUCTION

Different geomorphology-related models have been introduced for climatic changes which cover different geomorphology aspects including water and water flows, corrosion, and movements of earth's crust. Studies in the field of geomorphology are categorized into three groups of historical, catastrophic and systematic [1]. The current study is a systematic one in which Shiraz geomorphological basin is investigated. According to the fact that systematic point of view is of great complexity, Shiraz geomorphic basin is shaped in the form of Jurassian screw, especially in the form of a syncline. The mentioned basin is the same as the Zagros mountains from the structural and morph-tectonic as well as morph climatic point of view. Basic level of Maharloobasinis located in a Zagros folded syncline valley. Screwed structure of the mentioned basin is made up of three geomorphological units and tectonic cavity which has been under the effect of tectonic, climatologic and hydro geomorphic logical processes [2]. According to the fact that Zagros grand basin select free level of Persian Gulf as its basic level, Shiraz geomorphological basin is considered a dynamic one. Consequently, it is necessary to have an algorithm ruling geo-climate trend of balanced and sustainable structure of the basin. Actually, it is stated that future prediction based on evidence and

documents can be a valid index of the past changes. Application of this method for future study of Shiraz geo-climate system as well as identification of the effects of the factors which affect climatic system of Shiraz basin is of the vital importance. The mentioned necessity can be an invaluable tool to study such complicated issues as changes of Shiraz geomorphic basin in which the study is based on conception and comprehension. As a result, Shiraz geo-climate measures have been scrutinized. These measures are useful tools to find out the effects of various options while reliance on these measure requires a great care. Additionally, their limitations have to be taken into account [3-18].

2. METHODS AND MATERIALS

Shiraz geomorphic basin with the area of 393184 square kilometers and perimeter of 38203 kilometer includes Gooyom, Sadra, Golestan, Shiraz and Maharloo as well as Sarvestan. According to metric georeferenced system and geographical coordination of Zone 39, clear overlap is seen while Shiraz geomorphic basin and city of Shiraz do not completely overlap. According to the central role of city of Shiraz in the given geomorphic basin, it is possible to name the basin "*Shiraz basin*" while it is also possible to name the basin "*Maharloo*" due to basic-level of the basin. Due to the overlap of Maharloo and Sarvestan at east-south boundary, the basin can be called "*Saravestanbasin*" as well. However, it is more reasonable to name the basin as "*Shiraz basin*" due to the vital role of city of shiraz. To have physiographic interpretations of the given basin, it is required to refer to topographic maps with the scale of 25000, 50000, 250000 and 500000. Satellite database and ground or aerial mapping are of great use as well.

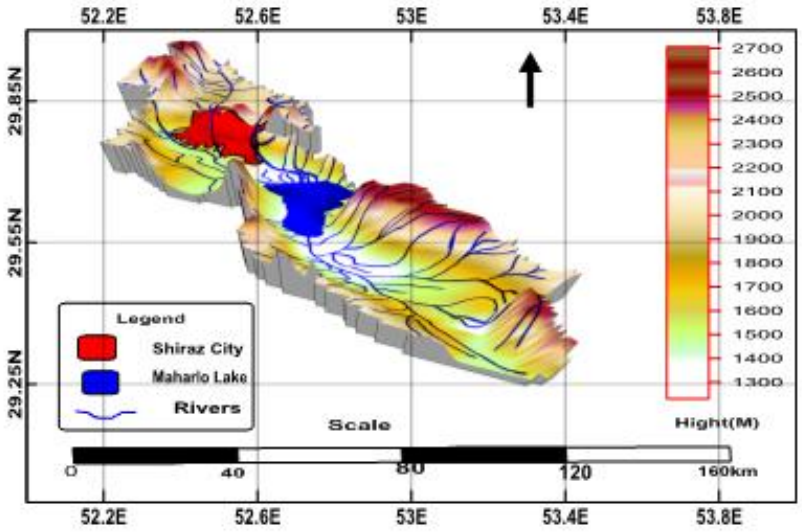

Figure1. *3D map view of the geomorphic basin of Shiraz*

The next step is aimed at transmitting digital data extracted out of 7 resources into geographical information system to have a detailed view of the mentioned basin. Figure 1 shows the schematic view of Shiraz geomorphic basin, an independent hydrologic basin, which has more than 95% overlap with geomorphic basin. The plateau on which city of shiraz is located is shown in red on the map. Actually, it is located above Maharloobasic-level. It is worth noting that ordinary people deem basic-level of Maharloo as lake which is in fact of Karst type based on geomorphological, hydrologic and geo-climate characteristics of Maharloobasin. It plays an important role in geohydrology of geomorphic zones and neighboring zones as well. The last one is actually evident according to geo-neurotic status of hydrographic network of Maharloo.

2.1. Geo-Morphism Related Characteristics of Shiraz Basin

Shiraz geomorphic basin is unique in terms of structure and form. The value of collecting information about this structure is related to its interaction with geomorphic characteristics and climatic factors. However, geomorphic characteristics of the mentioned basin are analyzed implicitly. Outputs of calculating height of Shiraz geomorphic basin are emerged in different forms including [19-48]:

1. Gooyom
2. Plateau of Shiraz

3. Maharloo lake which can be taken as basic-level
4. Sarvestan fault
5. Darian fault
6. Shiraz fault

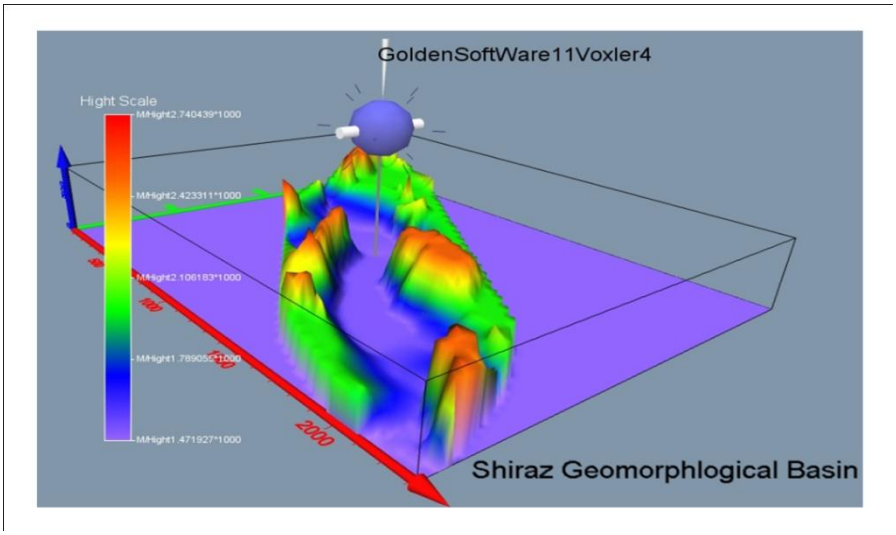

Figure2. *Represents Voxels output three-dimensional analog of height of Shiraz geo-morphism basin using filter of 0.2-0.85*

Shiraz plateau which is located on top of the plane represents formic status of Shiraz plateau. The mentioned plateau is located in Shiraz geomorphological basin which can be seen on top of the picture in small scale.

2.2. Geo-Morphism-Related Characteristics of Gooyom Graben

Faults are categorized into different groups in terms of direction of their movements. As for superficial faults, two concepts of gradient and elongation are presented. It is possible to calculate these two concepts as well. Based on one categorization, faults are categorized into two groups: slip faults and trans current faults.

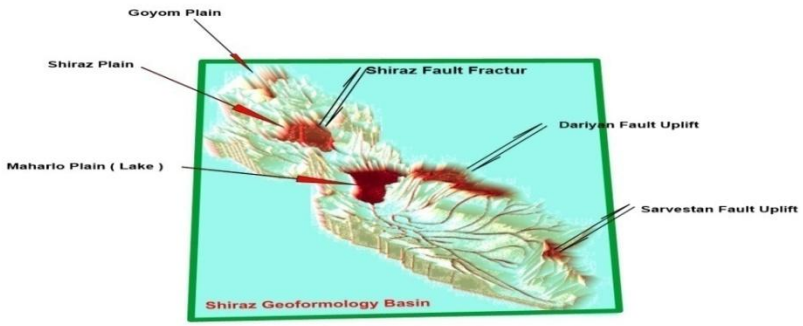

Figure3. *Shows a voxels output analog of height of Shiraz geomorphological basin using filter 0.7-0.85.*

As for slip faults, the degree of movement along gradient of the given fault is calculated while in trans current faults, horizontal movement parallel to the given fault is calculated. Slip faults are those faults in which movement or slip is occurred along gradient of the fault. Keep in mind that it is not possible to figure out if the what part of the fault underwent movement just by looking at the fault. The only thing to guess is the direction of that movement. As for the surfaces of slip fault, the block positioned above the fault is called hanging wall while the block positioned under the fault is called foot wall. Due to tension, some faults are created which in combination with the neighboring faults lead to

normal faults. These faults are a series of faults with different gradients in terms of direction. In these cases, blocks under the fault are called Graben and blocks above the fault are called horst. Gooyom plateau is a good example (figures and). However, area of the mentioned plateau is of classic status [49-84].

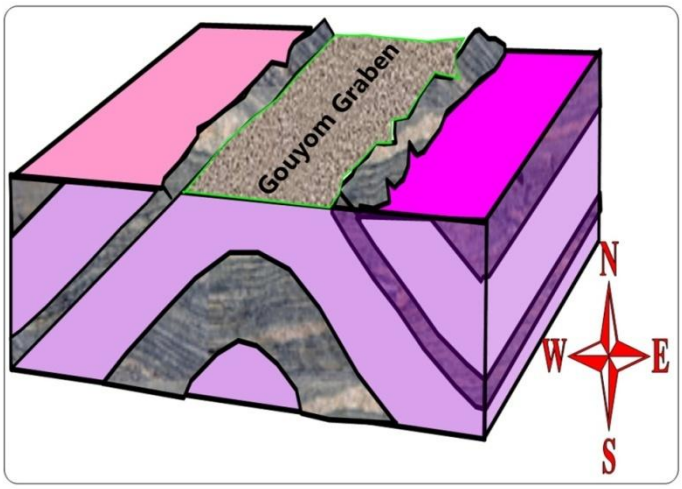

Figure4. *Represents tectonic model of Gooyom Graben for Shiraz geomorphological basin*

2.3. Geo-Morphism Related Characteristics of Shiraz Graben

Results of spatial analysis provide three-dimensional inputs for topography of Shiraz geomorphic Graben which is seen in figure 5. The figure shows that the mentioned Graben is cut by faults so that it can be seen on the picture. More specifically, one fault in the middle of that plateau is under the effect of that occurrence. This condition affects geo-neurotic features of the basin severely. Additionally, it is under the influence of hydrographic network. Geo-neurotic network is also under the effect of changes and fluctuations of the climatic system of the given basin.

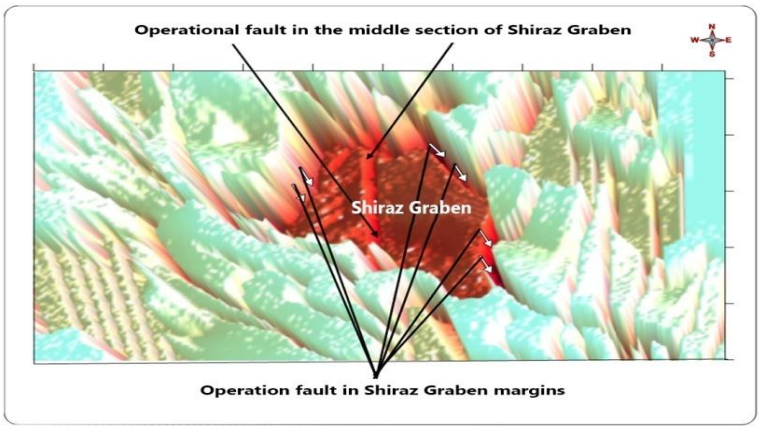

Figure5. *Represents voxel analog for Shiraz geo-tectonic plateau considering the spectrum of .45-.95*

2.4. Geo-Morphism Related Characteristics of Maharloo Geological Basic Level

Maharloo lake is considered the basic level of Shiraz geomorphological basin. This lake which was created due to 89synclinal fault subsidence are supplied by Nahr-e-Azam, Chenar-e-Rahdar, and Nazarabad rivers. Accordingly, chinar-e-rahdar river originates from Adam mountains and passes southern Chenardast and finally reaches Maharloo. Nazarabad river originates from Nazarabad and Selow mountains located at east-south section of Maharloolagoon and passes Sarvestan plateau to reach Maharloo lagoon. However, the area of this lake differs in different seasons. Actually, the dependence is on annual precipitation, vaporization, lime alluvia of Sachoon formation, salt domes located at east section of the lake, water of Maharloo lake which is laden with Sodium chloride, magnesium, sodium sulfate. It is one of the most important salt resources so that its salt is used for

petroleum industry. Maharloo lake which is of 1450 meters' height in the lowest section to 1500 meters along the boundaries can be deemed as basic level of Shiraz geomorphological basin. According to geographical information system, it seems to be true that Maharloo is a kind of geographical cavities created due to an echelon folds. Geomorphological difference between these two Grabens can be clearly seen in figure 5. On the other hand, it is stated that Shiraz plateau has been under the influence of geotectonic while Maharloo basic level is a geological cavity created due to an echelon folds. Although east and west sections of Mharloo cavity is severely under the influence of tectonics, status of Maharloo plateau as a Graben is completely determined. Additionally, an uplift fault is seen around Sarvestan which is unique in terms of hydrographical features. The fact that Daiyan fault is also an uplift one can be of vital significance. It is claimed that Shiraz plateau is unsustainable, especially due to the fault line passing the middle section of the given plateau [85-102].

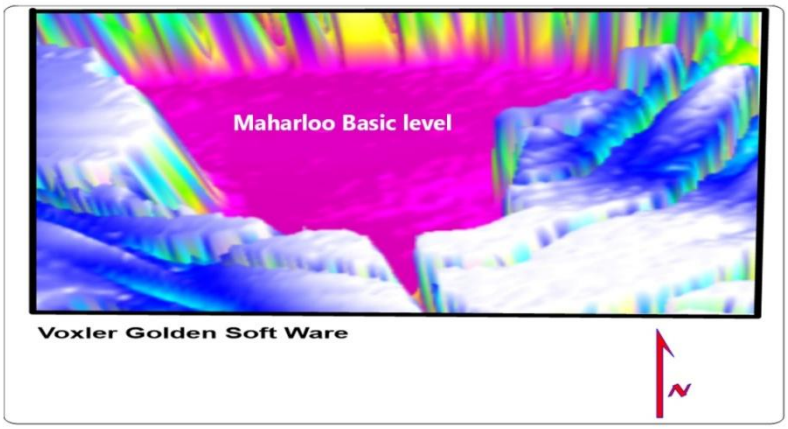

Figure6. *Another Fault Located in Shiraz Basin (figure 7) is Dariyan Fault*

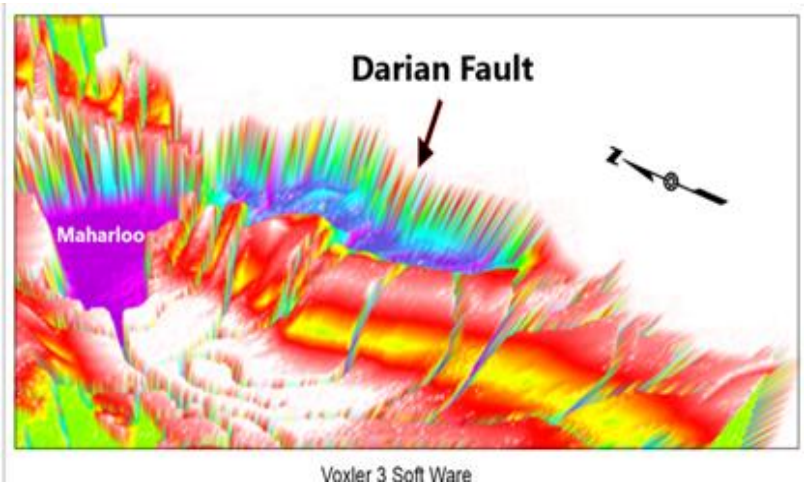

Figure7. *Daryan fault and its role in hydrological alignment of hydrographic network of Shiraz geomorphic basin in the range of 0.2 to 0.9 μm*

2.5. Zoning of Shiraz Geo-Morphism Basin

In geomorphological point of view, Shiraz basin is categorized into multiple zones:

1. Anticlines which cover east and west basins in discrete way. As a matter of fact, it is the main reason for independence of that basin so that the basin is of 2000 meters' height. The reason for discreteness of anticlines can be the role of tectonic movements.
2. Synclines: there is a continuous syncline which elongates from west-north to east-south. It is located in between anticlines. The mentioned syncline is actually a cavity north of which is of tectonic nature and center of which is of structural nature and south of which is also is a combination of tectonic and echelon fold. As a matter of fact, the cavity is laden with alluvia and this may be the reason for the formation of Shiraz plateau. In the middle section, the given cavity is laden with water and accordingly, it is the very place for Maharloo basic level. (figure 9)

3. Faults whose role is in geomorphic gradient of the basin. Even it may lead to emergence of unique structures, especially parallel to the movement of geo-neurotic network of the basin.
4. Hydrographical network which is reaching Mahraloo basic level.

Accordingly, the composition of Shiraz geomorphic basin can be a heavy but dynamic system. Shiraz geomorphological basin is under the influence of four tectonic fault cuts.

1. Gouyom fault which leads to the formation of Gouyom Graben
2. Shiraz subsidence which is the bed for Shiraz city
3. Uplift of right margin of Mahrloo in the distance between Darian and Mahrloo
4. Uplift of Sarvestan in the distance between Fasa and Shiraz geomorphological basin

Satellite pictures have shown that some changes have happened to the gradient of this zone which are beyond Shiraz geomorphological basin. On the other hand, triplet zones are seen on the geotectonic surface which are the result of quaternary climatic changes. According to figure 8, neo-tectonics may lead to over thrust faults and then, quaternary changes and fluctuations have their influence upon the basin. Consequently, Shiraz geomorphological basin is under the influence of changes and fluctuations. These changes and fluctuations is of tectonic nature. According to the geological structure of the basin, tectonic changes are seemed far-fetched. But, the main point is that the effects of climatic processes are inevitable. Accordingly, during the study of this basin, it is not reasonable to rely only on internal factors. On the other hand, geomorphic and climatic factors are also in cybernetic balance [103-143].

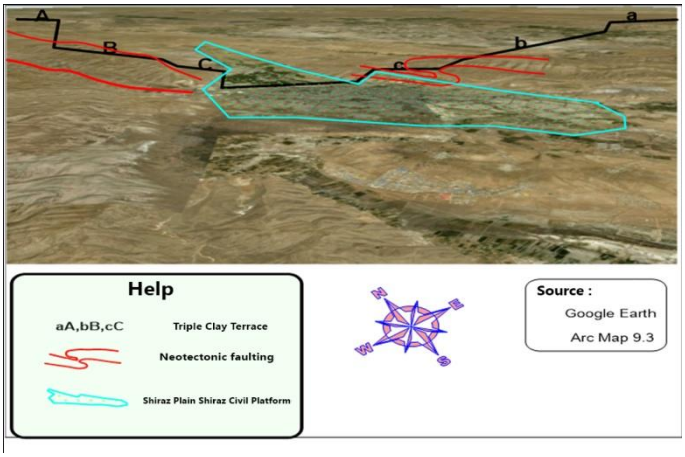

Figure8. *Geotectonic and Chlamytic Landforms of the Geomorphic Basin of Shiraz*

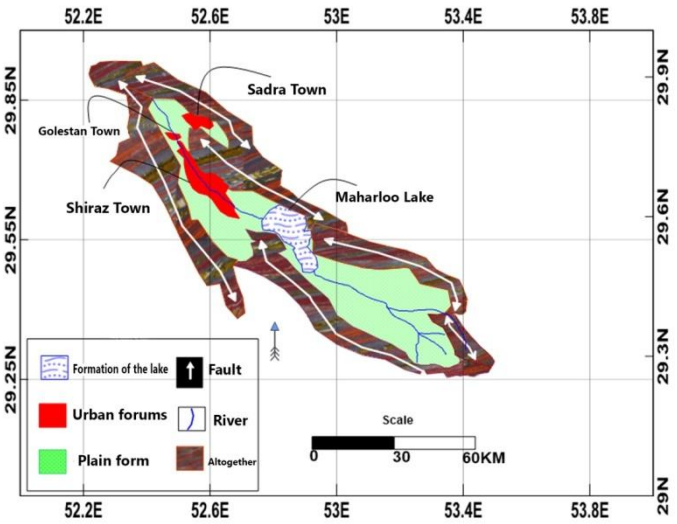

Figure9. *Geomorphic zonation of Shiraz Basin*

3. RESULTS AND DISCUSSION

Similar to other basins, Shiraz geomorphological basin is of dynamic nature. Accordingly, it is necessary to have an algorithm ruling geo-climate trend of balanced and sustainable structure of the basin. Actually, it is stated that future prediction based on evidence and documents can be a valid index of the past changes. Application of this method for future study of Shiraz geo-climate system as well as identification of the effects of the factors which affect climatic system of Shiraz basin is of the vital importance. The mentioned necessity can be an invaluable tool to study such complicated issues as changes of Shiraz geomorphic basin in which the study is based on conception and comprehension. As a result, Shiraz geo-climate measures have been scrutinized. These measures are useful tools to find out the effects of various options while reliance on these measure requires a great care. Additionally, their limitations have to be taken into account. The best basin management system is management of crisis. The reason why this option has been chosen is related to the fact that in crisis management system, proportionate proceedings are taken into account for each demand. Additionally, if an unexpected change or fluctuation pops up during the administration of the management system, some costs are incurred because the basin moves back to its previous balanced and sustainable status. It is claimed that crisis incurs some costs. As for planning and risk management systems, changes or fluctuations are predicted so some capital is saved for the time of crisis. These costs are not required and are not possible to be collected in the given basin.

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