Multi-Knowledge Electronic Comprehensive Journal for Education and Science Publications (MECSJ)
ISSUE (24), Sep (2019)
ISSN: 2616-9185
www.mecsj.com

MORPHOMETRIC ANALYSIS OF SIWAYL BASIN BY USING RS AND GIS TECHNIQUES

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Abstract

Morphometric analysis is one of the important study in the natural sciences in general, and geomorphology and hydrology in particular, to describe the nature of surface drainage networks. The study area lies in north of Iraq, in Al-sulaymaniya province. With an area of (1545.1) Km². And the geographic coordinates of the study area is (35°.28`- 35°.52` N). (45°.20`- 46°.24` E). DEM image were used with (90 m) resolution and the drawing tools in ARC GIS program to delineate the total basin of the study area and watersheds. We conclude that there were 3 main watersheds in the study area and that group of parameters were calculated such as (linear, areal and relief properties)). The study shows that the stream density was (1.77) Km/Km^2 which mean that the study area has a bad discharge of water and sediments, the elongation in the study area is (0.55) and that mean the study area is closer to a rectangular shape, and the relief in the study area is (25.1) m/Km and it reflects that the study area had rich effects of erosion and weathering.

Keywords: Basin, RS, GIS, Morphometry.

1. Introduction

A drainage basin is a form of the Earth's surface, the result of interactions between a variety of different atmospheric or surface factors and topographic surface resistance. Under normal circumstances, precipitation is the main source of matter and solar radiation is the main source of energy. The resistance of the topographic surface is determined by its height, the resistance to erosion of the constituent rocks, the proportion of vegetation, the presence of a layer of soil, etc. The interrelationships between these factors and their time distributions and space governance largely evolve and the state of the topography of the sewage basin. According to the discipline mandate to deal with the interrelationships between components of the environment. The current surface of a drainage basin is the result of a long evolutionary process, during which a dynamic equilibrium between the general flows of matter and energy is achieved and the variables that determine the basin behavior towards these flows. In general, there are two sets of factors with different directions: one that acts as forces that tend to lower the surface of the pond continuously and another that resists this erosion process, which lends unity to the entire pond and is subject to it. The main elements that contribute to determining the characteristics of the basin are rock type, relief, soil type, depth and vegetation.

2. Material and methods

2.1 Geographical location

The valleys are an important feature of the landscape of environmental modeling.

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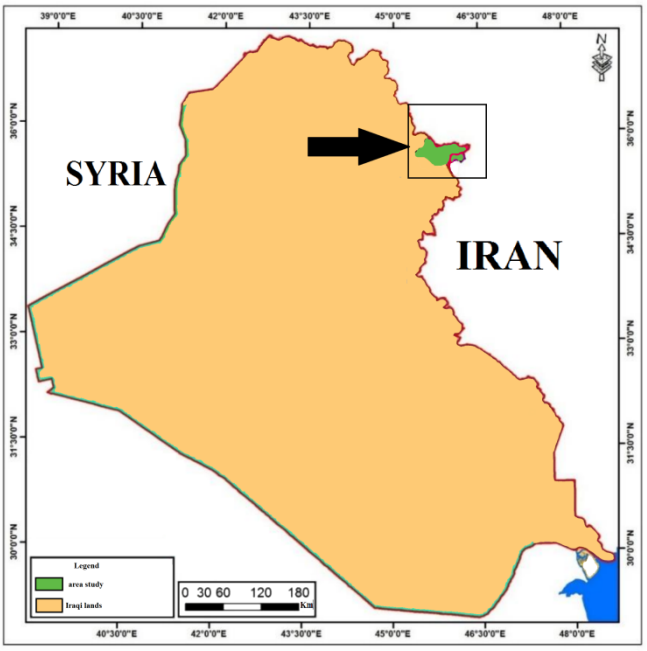

Figure (1): location of the area study in Iraq.

For example, they are areas of transport for many materials from highlands to lower elevations, particularly sediment flows and other confined materials that represent areas from which water and wind drain are transferred. Describing the valleys of DEMs is an important step in environmental, hydrological and geomorphological modeling. [2]. The study area is located in northern Iraq in the province of Sulaymaniyah. The geographical coordinates of the study area are: - (35 °. 28`- 35 ° .52` N). (45 ° .20`- 46 ° .24` E). With an area of (1545.1) square kilometers, as shown in Figure (1)

2.2. Before processing in the search

A DEM image (90 m) was used in the research [3]. Two topographic maps of scale 1: 100,000 were identified for the Sulaymaniyah and Banjwen regions using the nearest polynomial correction under ERDAS 9.1 to determine the extent of the study area.

The maps were performed using WGS84 and UTM 38N projection. Using ArcGIS 10.3 software.

2.3. The Methodology

This research achieved by number of steps as in the scheme Figure (2)

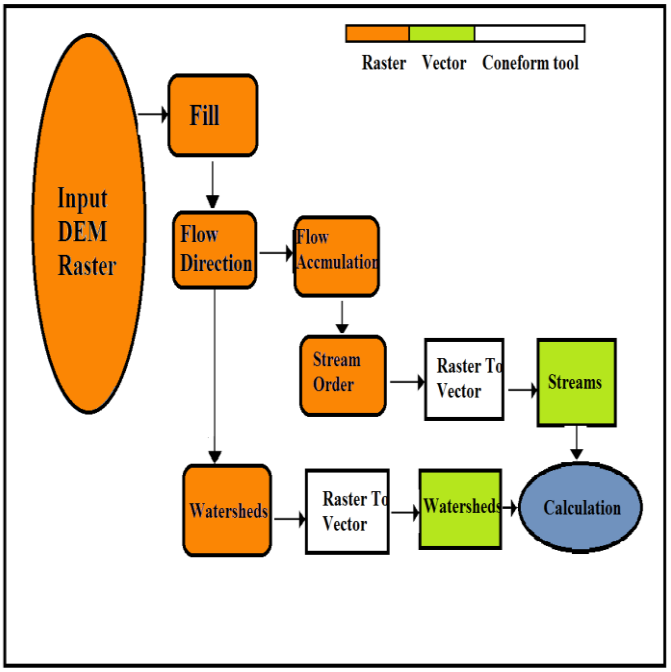

Figure (2): methodology of the study.

3. Results and Discussion

3.1. Morphometric Characteristics

Morphometrically analysis of any valley network demands first of all the adoption of a classification system.

Then, each stream segment and drainage basin may be assigned according to the principles of the system and to the extent to which the network has developed.

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The size of drainage basin influences the amount of water yield, the length, shape, and relief affected the water and sediments yield and the character and extent of the channels affect sediments availability and rate of water yield. [4].

3.2. Stages of extracting drainage net

Several steps have been taken to extract the sewage network of the study area as part of it is shown in Figure (4).

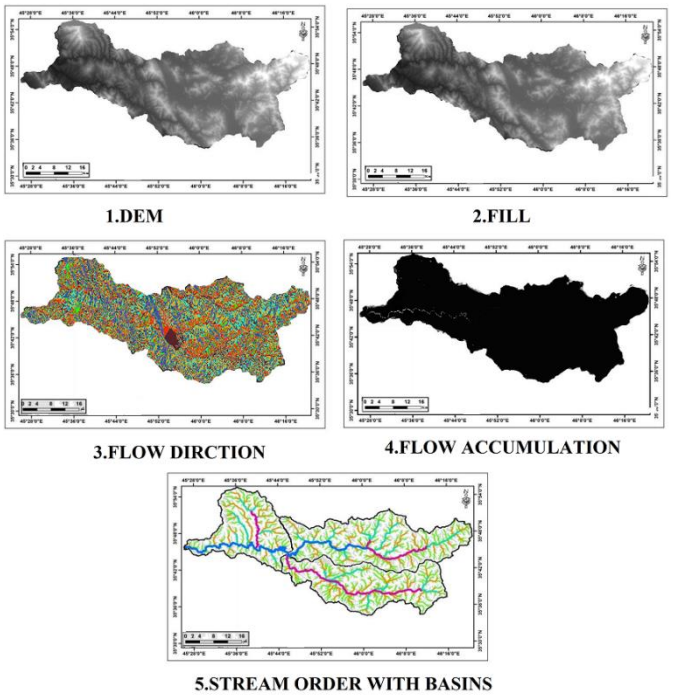

Figure (3): extracting drainage network.

3.3. Calculations of Morphometric parameters

From Figure (4) the step no. (5) There were 6 stream orders, we took the stream order no. (3). because this stream order is suitable between High-density streams net and Low-density streams net. There were (3) main watersheds (shalar,qizilja and siwayl The Main) . Some of the parameters were calculated by using calculation geometry, Clip Raster Tool and measuring tool in Arc GIS program such as (the basin area, basin length, basin diameter, stream length, and the differences between max and min altitude) as in Table no.(1)

Table 1:(Siwayl Basin) Linear, relief and aerial morphometric

Sl. No	**Parameters**	Formulae	References	Results
1	Stream	Hierarchical	Strahler [1]	6th
2	Stream	Based on	Strahler [1]	1324
3	Stream	Length of	Horton (1945)	2735
4	Bifurcation	*Rb*	Schumm(1956)	4.03
5	Drainage	D= ΣLu/Au	Horton (1945)	1.77
6	Stream	F=ΣNu/Au	Horton (1945)	0.85
7	Form factor	Ff=A/LP2	Horton (1945)	0.23
8	Circulatory	Rc=4ΠA/P2	Strahler(1964)	0.27
9	Elongation	Re=D/Lp	Schumm(1956)	0.55
10	Relief ratio	RH=H/Lp	Schumm(1956)	25.1

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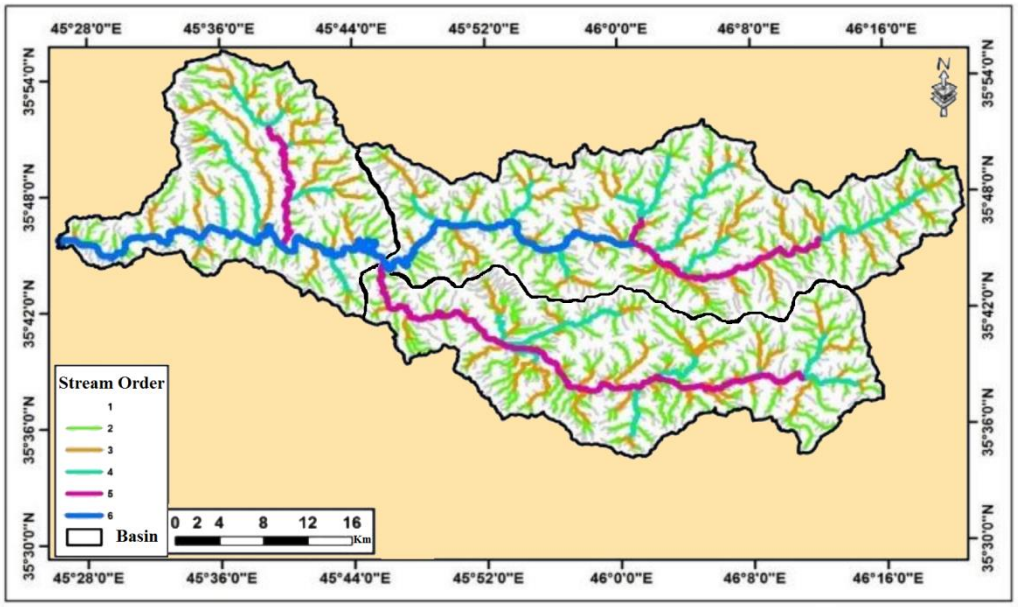

Figure (3): Basins of the study area

4. The Conclusion

1- The present study shows that the purposes of morphometric Characteristics is to derive information in quantitative form about the geometry of the fluvial and geomorphological system.

2- The using of DEM images with 90m resolution is very effective and accurateinthe results.

4- The number of flow in the study area (1324) which means that the study area has many valleys for drainage due to topography.

5- stream length in the study area is (2735 Km) which means that the study area has a good discharge for water and sediments.

6- Bifurcation rate in the study area is (4.03), which means that the study area has climatic and rock homogeneity.

7- The form factor in the study area is (0.23) which means that the study area has a longitudinal extension in the area due to the direction of runoff and the nature of the terrain and slope.

8- Circularity ratio in the study area is (0.27) which means that the study area is far from the circular shape and approaching the rectangular shape.

9- The elongation in the study area is (0.55) and that means the study area is closer to a rectangular shape.

10- The relief in the study area is (25.1 m/Km) and it reflects that the study area had poor effects of erosion and weathering

References

[1]- Zavoianu, I., 1985. Morphometry of Drainage Basins. Published by EL-SEVIER Science publishing company.P, 250.

[2]-Wang, D, Laffan, S., 2009. Characterization of Valleys from Dems. P, p, 1-8.

[3]- http://srtm.csi.cgiar.org/SELECTION/.

[4]- Gregory, K, Walling, D., 1983.Drainage Basin form and process. Published by Bedford, London. P.25.

[5]- Strahler A.N., .1964. Quantitative geomorphology of drainage basins and channel networks In V T Chow Edition. Handbook of Applied Hydrology pp: 439-476

[6]- Horton R.E., .1945. Erosional development of streams and their draioach to quantitative morphology . geological society of America bulletin,55:275-370.

[7]- Schumm SA (1956) The evolution of drainage system and slopes in badlands at Perth Amboy, New Jersey. Geological Sicence America Bull 67: 597-646.

[8]- Strahler AN (1964) Quantitative geomorphology of drainage basins and channel networks In V T Chow Edition. Handbook of Applied Hydrology pp: 439-476

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