The Use Of Remote Sensing And GIS In The Study Of The Topography And Watershed of Lake Sawa, Iraq

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Abstract--- During the previous periods, the water bodies and the topography of the surrounding lands were studied through the use of manual ground survey techniques which require many efforts and high cost in addition to the long time for the purpose of completion. Following the development of the science of remote sensing and GIS techniques and their use in the field of hydrological studies, work has begun on the use of computer technologies to conduct these studies with high accuracy. With DEM techniques, which are used to study topography of the ground, to identify stereoscopic digital models and to analyze the morphologic characteristics easily, quickly and at low cost. It was found that the land around Lake Sawa is a crumbling and undulating terrain with elevations range from 14 meters to 26 meters, also the study revealed that most surrounding land are composed of Gypsum rocks.

Keywords: DEM,GIS techniques, Hydrology, Remote Sensing.

I. INTRODUCTION

In the stream flow phase of the hydrologic cycle, a precise topographic map is essential for tracing land of a watershed or drainage basin that contributes surface water on hydrologic budget of any particular water body(11). the production of the needed topographic map by manual ground surveys ways are financially expensive and require a long time, thus became the use of remote sensing technology since it is easy, fast and very cheap as compared to the other traditional means. Also, the availability of satellites images and digital elevation models (DEM), which gives scientific and qualitative progress in their use in hydrological applications was successfully utilized in this study. Remote sensing data were obtained using digital elevation models (DEM).

The accuracy of the work depend on the resolution of the used satellites' data, so 30 m was the satellite resolution of this study. The employed data helped to provide good information about; the water drainage pattern that feeding the lake, the topography of the surrounding land and the achievement of a three dimensional 3D vision using the GLOBAL MAPPER program.

II. SEARCH AREA

The search area of Lake Sawa is located to the southwest of the city of Samawah (faraway approximately 26.57 km), Iraq, at an angle of 88.7 W, as shown in map 1, It is small and closed natural lake covers an area of about (5 km2) and with11.9 km parameter. The closest distance to the Al-Atashan River is about 3.5 kilometers, The distance from the Iraqi-Saudi border is estimated at 200 km.The coordinates of the lake center are 45 00 00 E, 31 18 50 N, according to UTM, ZONE 38 DATUM = WGS 84.

Fig. 1. Search area

III. RESEARCH MATERIALS

For the purpose of completing this research, the following materials were used:

1-DEM digital images of the US STRM satellite data with resolution of 30 meters which covered the Lake

Sawa area.

2- ARC MAP which produced by ERSI for hydrological analysis of the research area.

3- GLOBAL MAPPER program to draw a stereographic topography of Lake Sawa and study water levels.

IV. THE METHOD OF WORK

At the beginning of the work, the geographic regression of the digital elevation model used by UTM was done in order to bring the map to the correct location for the global coordinates. Then, through the use of DEM digital images, ARC MAP and GLOBAL MAPPER programs, the following applications were implemented:

1. Contour map:

The contour map of Lake Sawa was produced using the digital elevation model DEM with a period of 2 m. We notice from the map that the lowest level is (-4 meters) and the highest level (30 meters) as shown in Figure (2).

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SLOPE ANGLE	LAND SHAPE
0-2	Flat ground
2-5	Easy land
5-15	Wavy ground
15-35	Low hills
35-55	High hills
55 <	High mountains

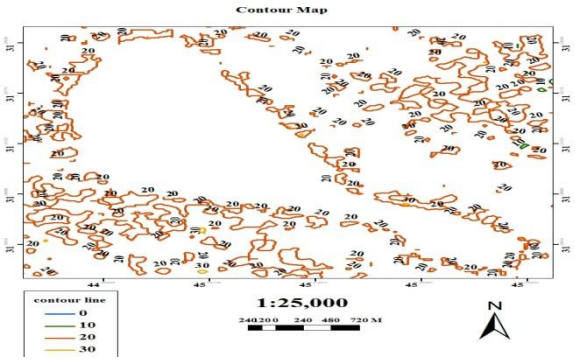

Fig. 2. Digital Contour Plan (Work of the Researcher)

2-. Stereoscopic model

The model of Lake Sawa, which illustrates the nature of the land surrounding the lake was obtained by Using the GLOBAL MAPPER and the DEM model,. It is unpretentious land with uneven heights characterized by rigid gypsum rocks. The high regions locate on the western side of the lake and the water level can reach 20 meters (MSL).The highest point of the surrounding areas of the lake is 26 meters from the sea surface as shown in Figure (3).

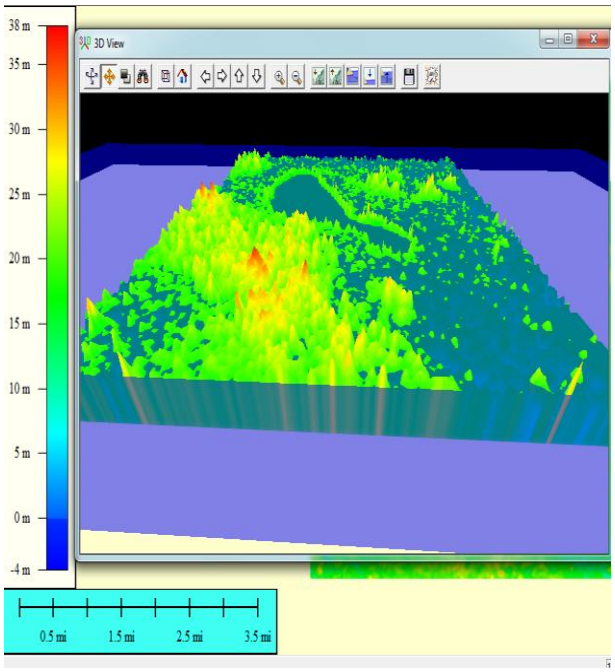

Fig. 3. Hue form of Lake Sawa (work researcher)

3--Regression

The slope of the ground represents the vertical distance difference between two points divided by the distance between them. DEMEK classification was used to identify the regression characteristics of the research area. This classification consists of 6 levels as shown in Table (1), It is clear from the regression map shown in figure (4) that the area around Lake Sawa has easy land slopes with abundant calcareous rocks.

Table No 1. DEMEK classification of regression properties

LAND SHAPE	SLOPE ANGLE
Flat ground	0-2
Easy land	2-5
Wavy ground	5-15
Low hills	15-35
High hills	35-55
High mountains	> 55

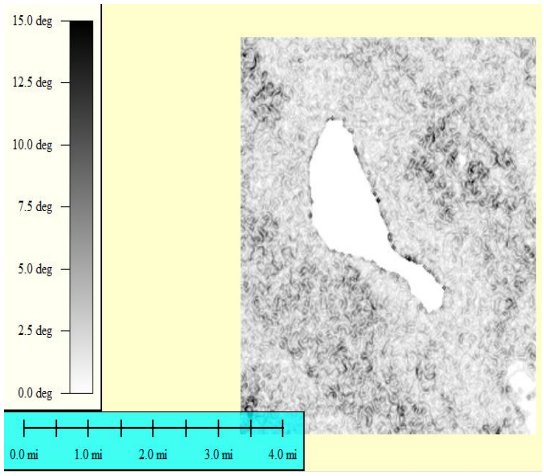

Fig. 4. Regression Plan (Work of the Researcher)

4- Map heights

The height map of the research area was produced using the ARC MAP and the DEM digital elevation model as shown in Fig(5), where the heights were limited between (-4 meters) and (30 meters) from the sea level of the land surrounding the lake and the other heights were confined between them. Refers to the nature of the ground is somewhat undulating and homogeneous within the perimeter of the study area.

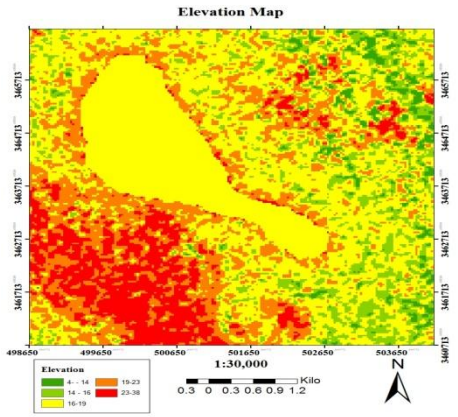

Fig 5. Height Map (researcher's work)

5—direction of flow

In this map, the direction of the flow of water from every cell to its neighboring cells is determined. The line that the water moves through the terrain to fallout into lake sawa was traced; it is essential to follow the watershed boundary, and then it will help to indentify the surface water contribution on the hydrologic budge of the of the storage system of this lake. Also, this map showed that most of the flow direction is from the west to the east by 100 degrees as shown in Figure (6).

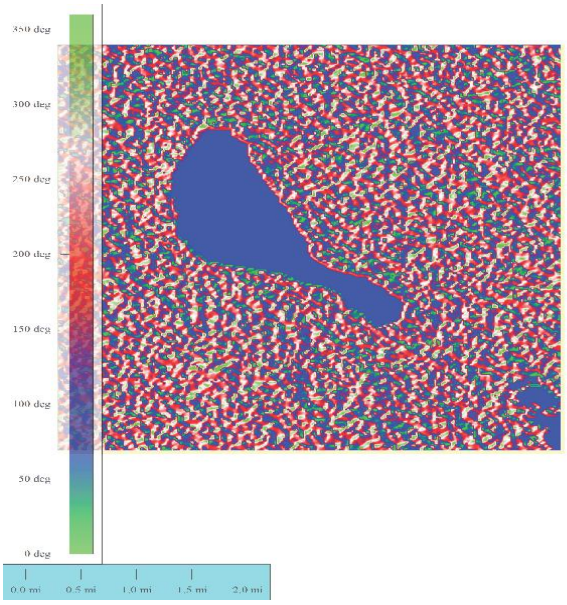

Fig.6. Directions map

V. RESULTS AND DISCUSSION :

The analysis of data was carried out to obtain the final results, which show the morphologic characteristics and topography of Lake Sawa, as shown in Table (2).

Value	Variables	Property
11.91	Area of study (area (km	Characteristics of the shape
5	Area of study area (sq km)	
1.71	(Show area (km)	
4.5	Length of area (km)	
1.1	Form factor	
0.03	Rotate the lake basin	
0.3	Elongation of the lake basin	
0.1	Ocean coherence ratio	
0.07	Coagulation factor	
4	Number of ranks	Morphometric properties
138	Total length of sewer (km)	
0.06	Density of discharge	
0.6	Technique of diffraction	
26	Maximum height (meters)	Terrain properties
10	Lowest altitude (meters)	
2.5	Regression rate (degrees)	
0.1	Direction angle (degree)	
0.004	Nature of the Earth	

Table. 2.The morphologic characteristics and topography of the Sawa Lake Recommendations(غي معلومات فيه الجدول ظاهرة

VI. RECOMMENDATIONS

Through the analysis of the results that were obtained, the research recommends :

1 -The use of remote sensing and GIS techniques is a convenient mean to conduct hydrological studies for the drainage basin and related matters because of savings; effort, time and cost.

2- It is recommended on the use of space images of DEM type for hydrological analysis after improving its data.

3-By using remote sensing technology the research can be extended to study the hydrogeological, physical and chemical characteristics of Lake Sawa, as it represents an important natural phenomenon.

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