

ASSESSMENT OF USING ARC GIS TO DETERMINE SOME LANDFORMS IN AL-SALMAN DEPRESSION/SOUTH IRAQ

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Abstract

The study area lies south west to Al- Muthanna governorate; it is about 140 km away from the governorate center. The study area is about 1296 km², between longitudes 44° 24' – 44° 41' Easting, Latitude 30° 18' – 30° 44' Northing. Space data used in this research is Landsat 7 images by the sensors ETM+ 2000 beside the DEM image product by Shuttle Radar Topography Mission SRTM. Using the present technique we can recognize the landforms in the area depending on characteristics in Arc GIS program and the ability in the program, as well as, accuracy of the program which become simulating with features in field. The sketch technique was done by using DEM image associated with tools box in Arc GIS program. In order to increase the accuracy of the results we used the "Hill Shade" method and adding some orders like "Aspect" and "Sink". From this technique we conclude that Hill shade method enables us to recognized depressions, structural plains, and pediments. And from Aspect we can recognize the slope direction while the Sink order we can recognized the sinkholes in the study area.

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Northing 30° 18'–30° 44', Easting 44° 24'– 44°

ETM+

.41'

.Shuttle Radar Topography Mission SRTM

DEM

Arc GIS

DEM

.Hillshade ()

Arc tools box

.Sink Aspect

2. Hill Shade Method

Shadows and shading provide visual information that is needed to understand topography and texture. To interpret patterns of shadows and shading in images correctly we need to be aware of how a scene is illuminated and viewed “variations in illumination produced by topography can cause pixels of the same material to range from maximum lightness when fully illuminated to dark when in shadow, this variability produces scatter plots that are elongated and tapered toward the origin (0 DN)”. Many of widely used images of Earth (e.g., Landsat, Spot, air photos) are acquired in mid morning. It is the time when shadows cast by topography and roughness elements are not too long and not too short for optimum photo interpretation of most scenes. (Morning images

avoid the clouds that build during the day in many areas, and, therefore they are more popular than afternoon images.) Everyone knows that shadows are prominent in images that are taken near sunrise or sunset when the sun is low in the sky. Spatially resolved shadows often reveal subtle features of topography and roughness that otherwise would go unnoticed, because small objects can cast large shadows. Low-sun satellite images of earth are not familiar to most images analysts, but they are more common for moon and planets. Information on sun azimuth and elevation generally accompany images that are standard products of remote sensing surveys and software [3]. (Figure 1-2) shows the stage of the hill shade method by using Arc GIS program.

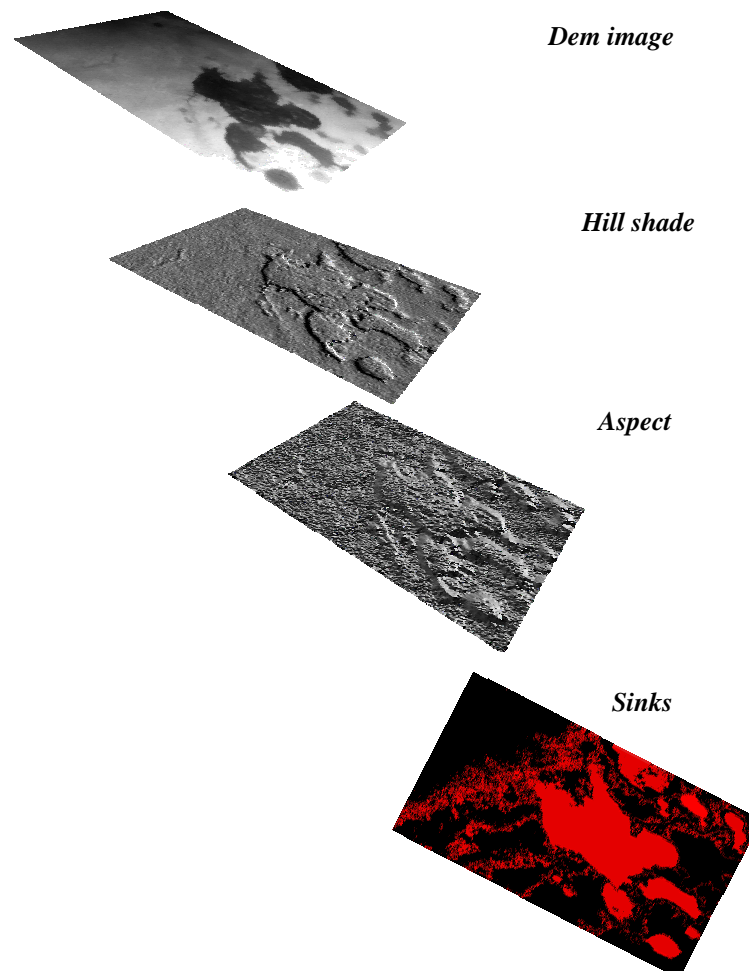


Figure 1-2: Show the stages of the hill shade method

Hill Shade method creates a shaded relief raster from an elevation (DEM) raster. The illumination source is considered to be at infinity [2]. Many names of this method can be found in the searches such as (shaded relief, water shed modeling....etc). Another definition, Hillshade represents the assumed illumination to earth surface as a result of the sun high and azimuth angle. Gave earth shadow data three dimensions [4]. These hillshades are typically used to enhance the aesthetic qualities of the elevation grid, or to help you quickly identify where hills and valleys are. hillshades continue a grid cell values ranging from 0 to 255 based on how directly the grid cell faces the sun. A value of 0 means that objects simply not facing the sun, or shadowed behind another topographic feature, while a value of 255 means the grid cell faces the sunlight directly. The user simply enters an azimuth and angle of elevation for the sun location. The sun location is 315 degrees

azimuth and 45 degrees elevation, which are unlikely values for most places in the northern hemisphere. It turns out that using realistic values (such as having the sun come from the south rather than the north) causes an optical illusion for many viewers in which the topography appears to be inverted (i.e. valleys look like hilltops and vice versa) [2].

In order to apply Hill shade Method we need to know the command line of the method as follow [2]:

```
HillShade_3d <in raster> <out raster>
           {azimuth} {altitude}
```

From the (Figure 1-3A), we could see the depressions when the azimuth is (315), and when the azimuth is (135), we could see the Structural ridges clearly (Figure 1-3B). Notice that the depressions become domes and when the azimuth (90) we could see the Pediments as in (Figure 1-3C).

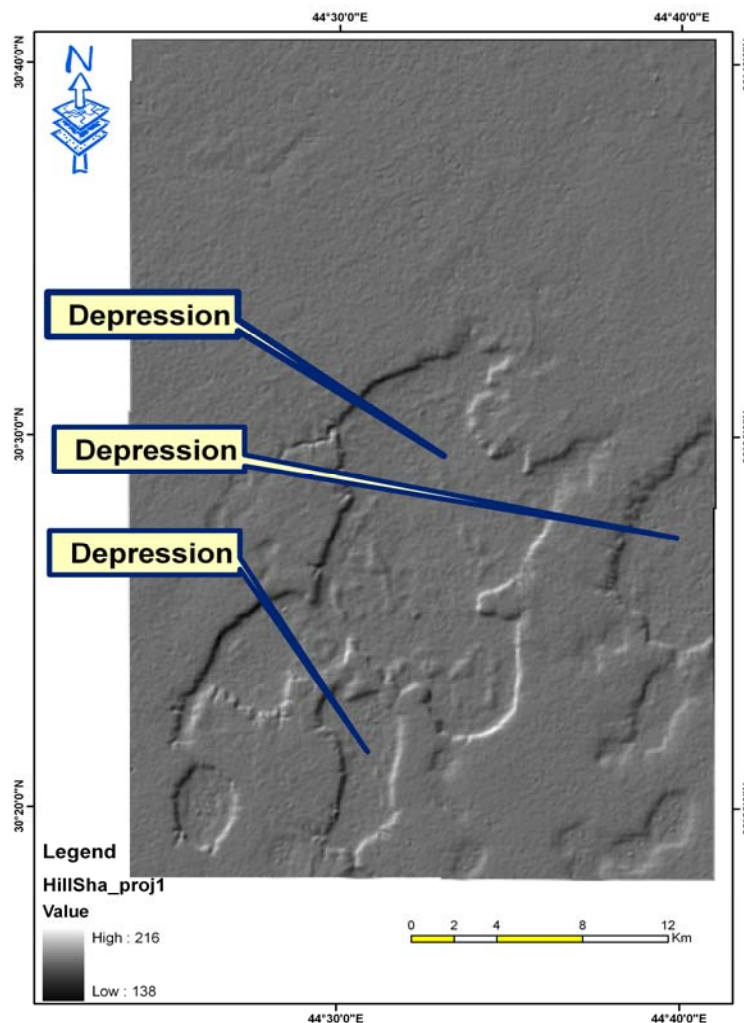


Figure 1-3A: shows the Hill Shade method at azimuth 315

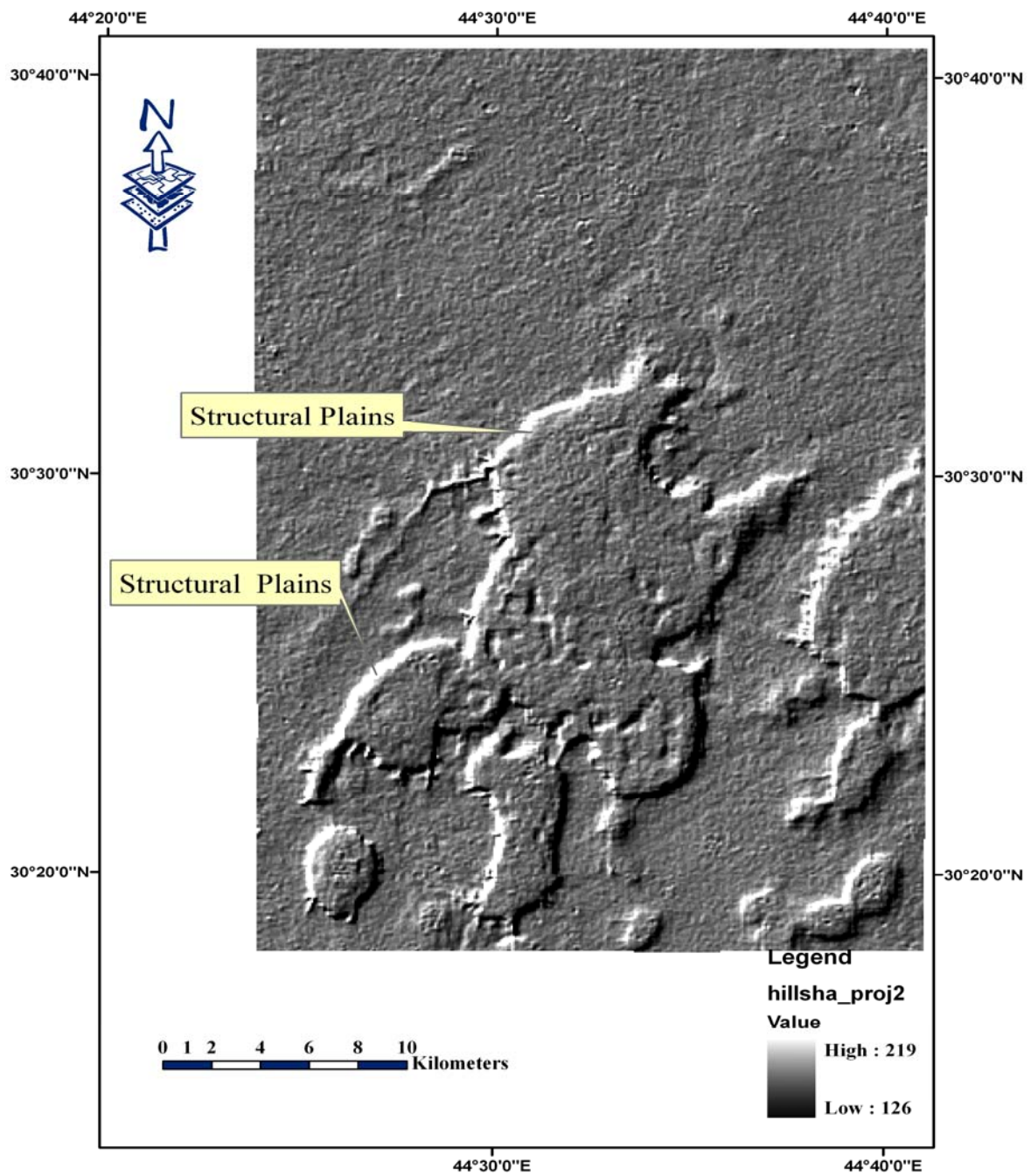


Figure 1-3B: shows the Hill Shade method at azimuth 135

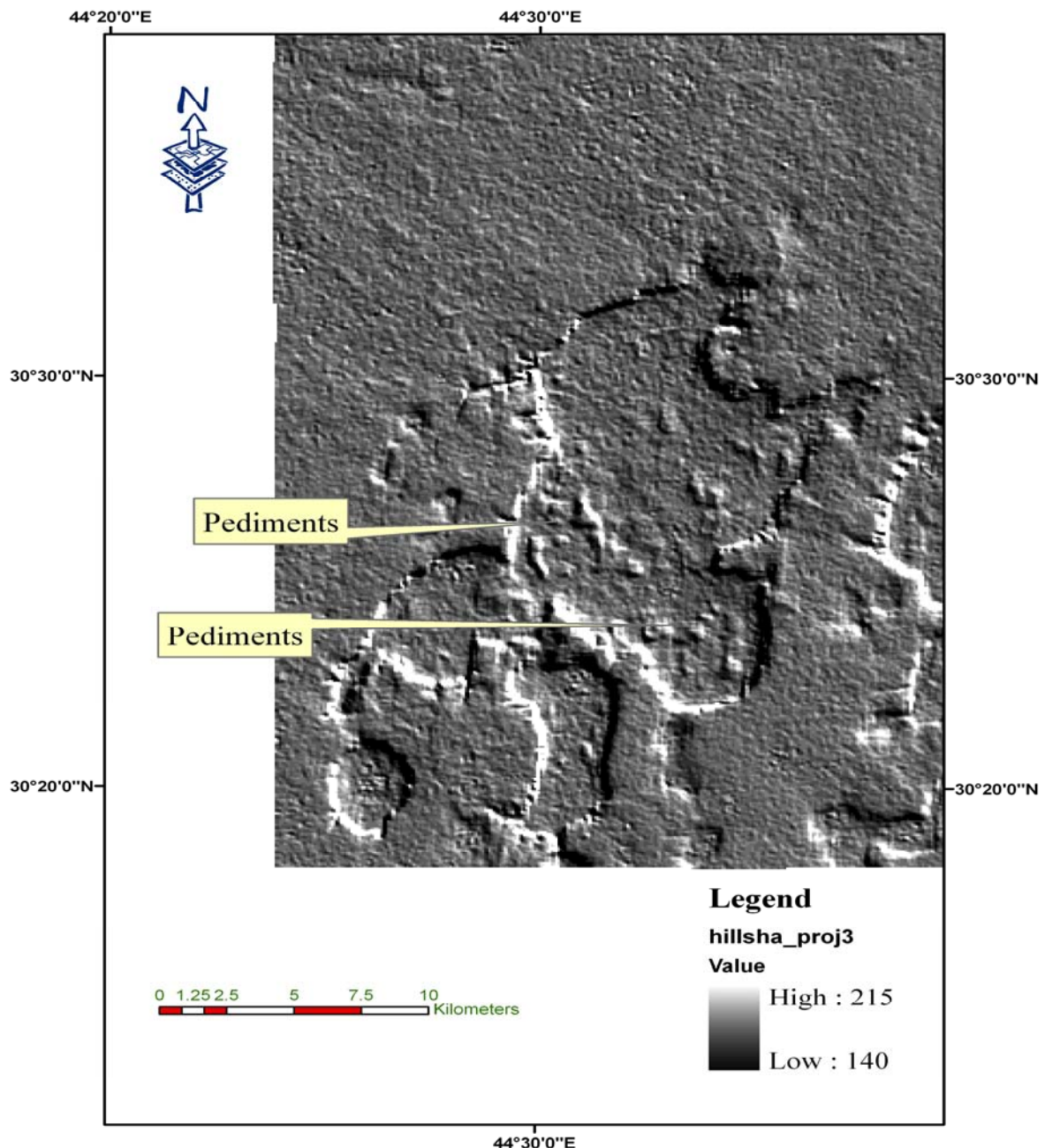


Figure 1-3C: shows the Hill Shade method at azimuth 90

3. Aspect

In order to make the features in the study area more distinct, the researcher applies the process Aspect. Aspect can be thought as the slope direction [2]. Another define the Aspect is an intuitively valuable habitat variable, north-facing slopes are typically cooler and more mesic, white south-facing slopes are generally warmer and more xeric (at least in northern hemisphere) and habitats can be dramatically different depending on which side the study is [5]. Aspect can be difficult to Analyze because

of its circular nature. The value of the output raster represents the direction of the aspect. This process applies on the area that have (zero slop) which mean (flat) as the study area (Figure 1-4). Aspect has many useful [2]:

- 1) Has optional parameters where you can specify the general atmospheric conditions in your area of interest.
- 2) Has optional parameters where you can specify how intensively it examines the local topography before determining the amount of radiation hitting an area.

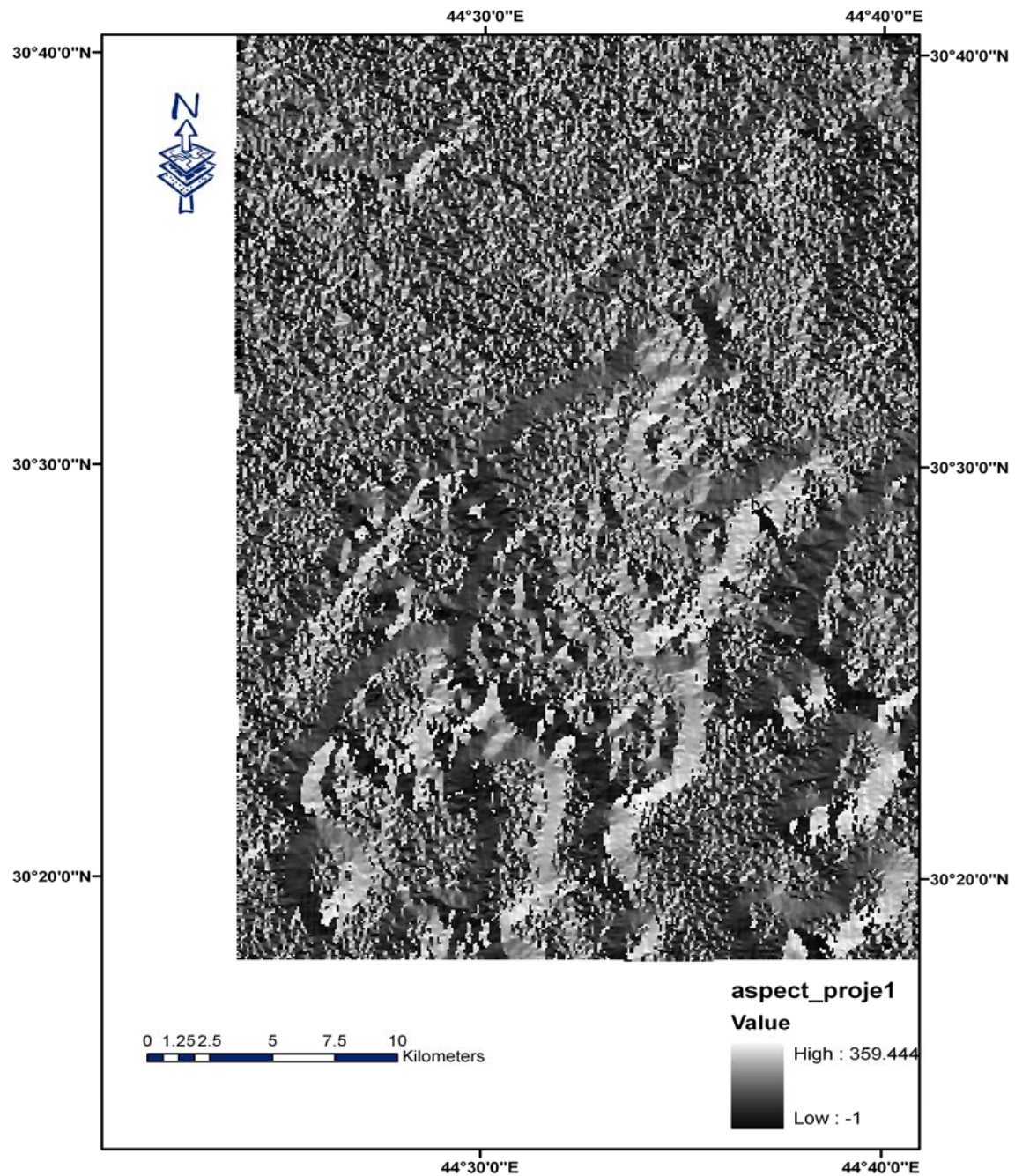


Figure 1-4: shows the Aspect method

4. Sinks

This technique enables us to identify all sinks in the researcher area as in (Figure 1-5), and to applied this technique we have to know the command line example (2).

Sink_ C: /data/flowdir C: /data/sink

5. Results

In the present study of Al-Salman depression/ South Iraq we found that we could recognize the following features:

- 1- From the hill shade method we can recognized the depressions when the (Azimuth= 315), and recognize structural plains at (Azimuth=135), and recognized the pediments at (Azimuth=90).
- 2- From the Aspect order we could identify the slop direction.
From the Sink order we can identified the sinkholes available in the area

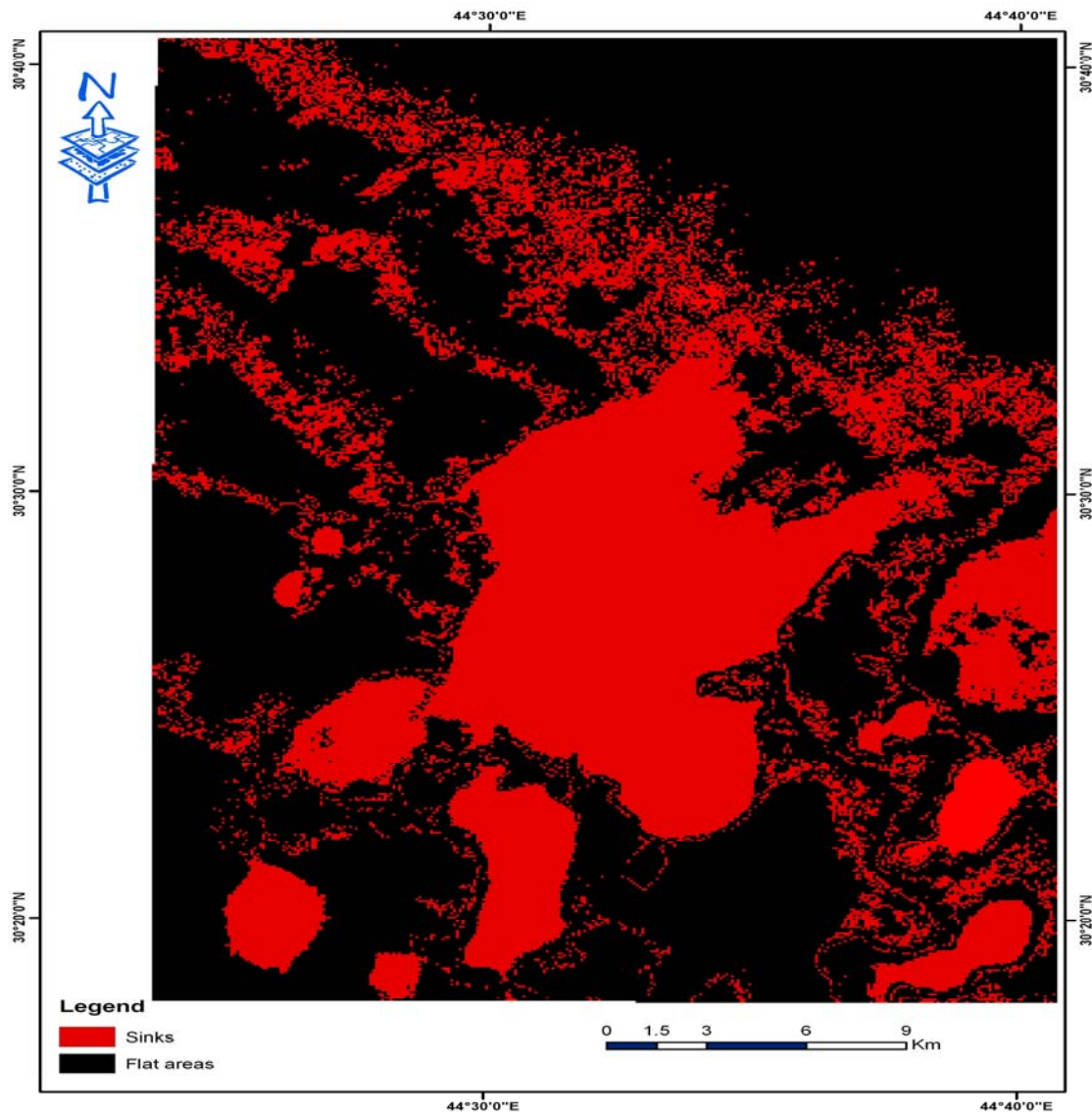


Figure 1-5: shows the Sink method

6. References

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