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Structural and Hypsometric Analysis of the Sinjar Anticline Using Remote Sensing Techniques: A New Perspective

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Abstract

A hypsometric and structural analyses were carried out for the Sinjar anticline, which is located in the Nineveh Governorate of northwest Iraq. The digital elevation model (DEM) was used to construct the hypsometric integral curve. The study aims to determine the geomorphological development stage and estimate the hypsometric integral, as well as to conduct a geometric structural analysis using GIS-based map data. To achieve this aim, contours were generated using the topographic map as a base map. The hypsometric curve of the entire Sinjar anticline shows an S-shaped curve, indicating that the landscape has reached a mature stage of evolution, according to the structural and hypsometric results obtained from DEM, and the geometric classification of the Sinjar anticline is non-cylindrical, open, moderately inclined, moderately plunging, and asymmetrical. In addition, the occurrence of alluvial fans on either side of the Sinjar anticline signifies a notable geomorphological characteristic resulting from parallel drainage systems. This configuration suggests the presence of a significant fault that intersects the area.

Keywords: Sinjar anticline; Remote sensing; Hypsometric analysis; Structural analysis; Tectonic activity

1. Introduction

The Sinjar anticline is situated in the Nineveh Governorate of northwest Iraq, just 120 km west of Mosul City, with coordinates of (41˚20′ to 42˚06′) E and (36˚15′ to 36˚30′) N (Fig. 1). It is roughly 42 km in Syria and 91 km long and 31 km wide in Iraq.

According to Jassim and Goff (2006), the Sinjar anticline is located in the Low Folded Zone of Iraq (LFZ). The region is included in the Zagros Fold-Thrust Belt (ZFTB). However, this belt is a division of the Zagros Foreland Basin. Which was formed by the convergent collision of Eurasian and Arabian plates, encompassing a significant portion of Iraqi territory.

Along the southern limb of the Sinjar anticline, on the Iraqi side, lies the highest peak at 1421 m above sea level.

The following studies were carried out concerning the current topic: Al-Daghastani (1989) provided comprehensive geomorphological data about the alluvial fans of the studied fold using remote sensing techniques. Weissel et al. (1994) showed that the degree of equilibrium between tectonic and erosive forces is correlated with variations in the hypsometric integral value and the hypsometric curve's shape. Al-Daghastani et al. (2004) utilized techniques of remote sensing to plot Sinjar fans for rainwater harvesting.