Faculty of Science-Geology Department

"Relationship between Paleotectonics and Neotectonics, of Sidi Barrani Area, Northern Western Desert, Egypt, Using Surface and Subsurface Geological Data"

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ABSTRACT

Sidi Barrani area lies in the western part of Matruh basin, that bounded by longitudes 25˚ 10’ and 26˚ 44’ E and latitudes 31˚ 5’ and 31˚ 44’ N, and located in the northern Western Desert of Egypt. This study aims to determine the relationship between the surface and subsurface structures of Sidi Barrani area, northern Western Desert, Egypt, using the surface geologic data, as referred to the newly remote sensing technology, and the subsurface geophysical data in the form of two-dimensional seismic reflection data, with the bore-hole data, and applying the geographic information systems.

Surface geological, geomorphological and structural information were obtained from the modern remote sensing systems, like multispectral Landsat 7 ETM+, aster and the hyper-spectral Hyperion sensors for the study area. The subsurface structures and tectonic evolution of the study area were studied using one hundred 2D seismic reflection sections and supported by the logs of nine deep wells drilled in the study area. In addition, the analysis encompasses the detailed investigation of the two-way time section (TWT), structure contour maps and cross sections for defining the general trends and timing of the regional structural- tectonic deformations.

The present work is grounded to account for the enhanced information content of the sensors provided; hyper-spectral analysis methods were used, Landsat ETM+ and DEM data were prepared for processing by mosaicking and radiometric corrections to the target area. False color Landsat ETM+ (bands 7, 4, and 2 in RGB) and (aster DEM) images of the Sidi Barrani area, Egypt, highlights major ENE-WSW, NNE-SSW faults and other lineaments trending NW-SE and N-S. Ratio images (5/7, 3/1, 4/3) and (5/7, 5/1, 4) were used for lithological discrimination of different rock types.

This has been carried out in order to understand how the surface geological features generated from the subsurface structural elements of the study area. The study proved that, the Upper Jurassic- Cretaceous rocks were dissected by systems of normal faults, trending in the WNW-ESE, NW-SE and N-S directions. These fault systems were originated in association with the Cretaceous-Early Tertiary tectonic deformations related to the Tethyan plate tectonics. There are conformable relationships among the produced surface structures which are carried out using landsat ETM+ image data and the subsurface structures, that are proven from seismic reflection data. Seismic data reveal some E-W, NW-SE and N-S subsurface faults, which are recognized on the Landsat ETM+ data.

The study area was subjected to different tectonic regimes across varying time intervals, that have a major effect on the hydrocarbon accumulations.

Moreover, the foregoing NE-SW deformational phases represent the maximum structural activities occurred through the Phanerozoic section of the study area. Moreover, the older folding phases (NNW-SSE and NNE-SSW) of the Early and Late Mesozoic reveal the start of structural reworkings for the deposited Paleozoic sequences. Added, the younger wrenching phases (E-W) and N-S) reflects the tangential tectonics of oblique and strike-slip fault elements.

The relation between the paleotectonic and neotectonics of the study area is a matter of contrversary. The paleotectonics stretched from the Mesozoic to the Early Tertiary, while the neotectonics extended from the Late Tertiary to the Quaternary.

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