Ain Shams University

Faculty of Science

Geophysics Department

Geophysical studies in East Abu Gharadig Basin, Western Desert, Egypt Utilizing Seismic Interpretations and Well Logging Analysis.

A Thesis submitted in Partial Fulfillment for the Requirements of
Master Degree of Science in Geophysics

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NOTE

The present thesis is submitted to Faculty of Science, Ain Shams University in partial fulfillment for the requirements of the Master degree of Science in Geophysics.

Beside the research work, which is materialized in this thesis, the candidate has attended ten post-graduate courses for one year in the following topics:

1-Geophysical Field Measurements.

2- Numerical Analysis and Computer Programming.

3- Elastic Wave Theory.

4- Seismic Data Acquisition.

5- Seismic Data Processing.

6- Seismic Data Interpretation.

7- Earthquake Seismology.

8- Engineering Seismology.

9- Deep Seismic Sounding.

10- Structure of the Earth

She successfully passed the final examinations in those courses. Concerning the language requirement of the degree, He also passed the final examination of a course in English language.

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ABSTRACT

Abu Gharadig Basin comprises many of the most productive oil and gas fields in the northern part of Western Desert. Many discoveries have confirmed the economic potential of this province, such as East Bahariya Concession, in which the area of interest in the present study is located. The study area; Amana Field is located in the western part of East Bahariya Concession. It is bounded by latitudes 29º 30' 15" N and ٢٩º ٣٣' ٥١" N and by longitudes 29º 29' 15" E and 29º 23' 40" E.

The main purpose of this study is aimed to evaluate East Bahariya Concession, especially Amana Field to provide a detailed study for the field, elucidate the subsurface geologic setting and clarify the structural elements of the study area. This study is based on the analysis of the available 3D seismic cube and well log data sets by studying the subsurface geologic structural features and the main potential reservoir markers (Abu Roash "G" Member and Bahariya Formation).

To achieve this objective, the current study started with detailed description of the geological setting of the area including discussion of stratigraphic sequence and structure of the north Western Desert, where Amana Field is located, through a review for the pervious geological studies. Then, detailed 3D seismic data interpretation was carried out in terms of horizon and fault identification to provide accurate information about the subsurface structural geometry and fault pattern of the study area. Then, 3D structure model has been built to develop a structure model of reservoir rock in the study area. Then, petrophysical evaluation of the interested reservoirs is carried out through analyzing the well logging data of the available boreholes. Finally, regional subsurface geological history and 3D seismic data interpretation was integrated with well logging data analysis to study the depth configuration and structural framework of the interested reservoir markers. The integrated geological and geophysical data supported detecting the best promising prospects for further exploration and development activities.

The representative elements of petroleum system include essentially source type, reservoir facies, seals and entrapment mechanism to form an effective trap. These elements of petroleum system were evaluated and new prospect areas were detected for further exploration and development work in Amana Field with respect to the seismic structural highs and suitability of petrophysical parameters in Abu Roash “G” Member and Bahariya Formation reservoirs.

The present geophysical and geological study disclosed that Amana Field represents a positive prospect due to presence of structural petroleum elements. They revealed that the structural geology of the area was affected by tectonic deformation system caused regional uplift (high structure) at the northwestern part of the study area. The principal structure responsible for the hydrocarbon entrapment in the study area was high structure corresponding to three-way dip closure of NW-SE normal dip slip faults that was very obvious on seismic sections, structure maps and 3D structure model.

Keywords: Amana Field, 3D Seismic interpretation, Petrophysical properties, 3D Structure modeling, Promising prospects.

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