A STUDY ON THE EFFECT OF THE STRUCTURAL-TECTONIC INFERENCES OF THE ABU GHARADIG BASIN ON THE SUBSURFACE-HYDROCARBON IMPLICATION, WESTERN DESERT, EGYPT

THESIS

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE DEGREE MASTER OF SCIENCE IN GEOLOGY

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BY

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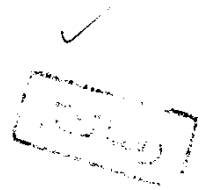

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NOTE

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

Besides the research work materialized in the thesis the author attended ten post graduate courses for one academic year in the following:

1- Laboratory Technique

2- Structure Geology

3- Geo-tectonic

4- Field Mapping

5- Sedimentary Rock

6- Sedimentation

7- Data Processing

8- Data Filtering

9- Petrophysics

10- Well Logging

He has successfully passed the final examination of these courses, beside, the English language course.

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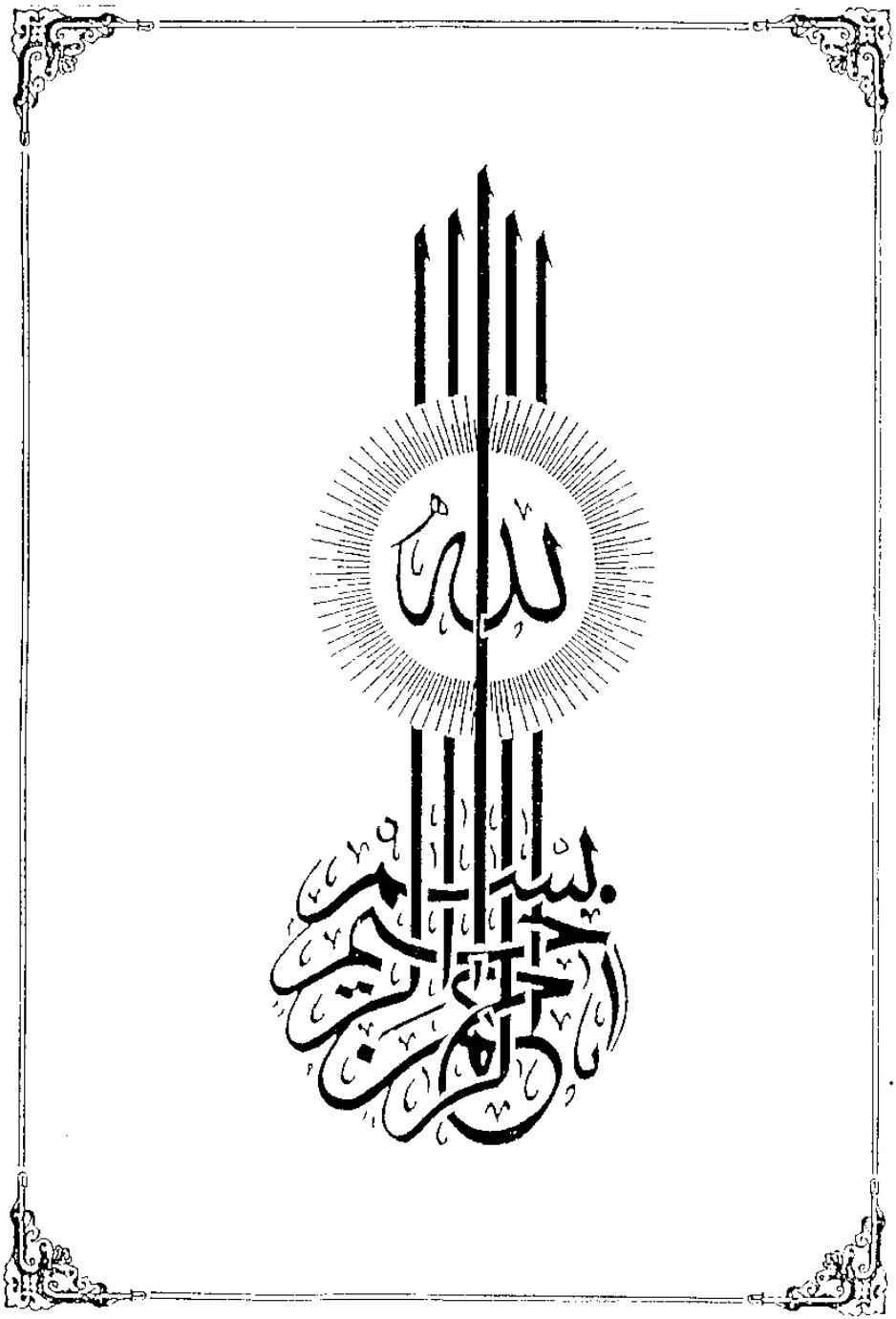

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ABSTRACT

Geophysical information in the form of seismic and well logging data and subsurface geological information in the form of composite well logs data, are used to study the effect of thermal-burial history on the hydrocarbon maturation and generation of the Upper Cretaceous rock units (Bahariya, Abu Roash and Khoman Formations) in the central part of the northern Western Desert of Egypt. However, it is worth-mentioning that, the conclusions arrived at through this work are tested and confirmed through the already known petroleum discoveries in this important part of such petroliferous province.

This currently achieved through four main processes: source rock evaluation, burial history, geothermal maturation and time of generation. Source rock evaluation is carried out through the determination of the total organic content (ORG) and the total organic carbon (TOC) in the shaly rocks; as a measure for the organic richness of the considered units. The calculated values of the organic carbon are abnormally high. Burial history is performed through the utilization of the sedimentational-structural setting of the examined wells in the studied area in relation to the implicated geothermal gradients; as a measure for th adaptability of this area to be hydrocarbon potential within the characteristic oil window. Geothermal maturation is revealed through the calculation of the local thermal effect, time-temperature index and vitrinite reflectance; as a measure for the capability of the given physico-chemical conditions of the inherited organic material to hydrocarbon products of varying habitats. Time of hydro-carbon generation is delineated through the computation of the time of onset generation, the time of

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peak generation and the time of end generation; as a measure for the efficiency of the available stratrigraphic intervals to complete the transformation cycle and the synthesise of hydrocarbons.

Time and migration paths of the hydrocarbons generated in the Abu Gharadig Basin are defined based on the maturation status, as well as the paleo-tectonics, porosities and hydrocarbon saturation maps. The traditional migration paths, which are accepted in the Abu Gharadig Basin, are controlled by both the primary and secondary migrations. The primary migration - of short distance nature - is considered to be responsible for the migration of hydrocarbons sourced inside Bahariya and Abu Roash Formations. The secondary migration - of long distance nature is considered to be responsible for the migration of hydrocarbons sourced from the Khatatba Formation of Jurassic age, through the fault planes to the overlying reservoirs. The total and effective porosity maps indicate that, the migration paths were directed from the internal depocentre to the outward parts of the basin. Maturation studies of the Bahariya and Abu Roash source rock intervals illustrate that, the Bahariya Formation reached its peak of generation during the deposition of El-Gindi Formation of Eocene age. These suggest that, migration would have been initiated from the center of the basin to the outward direction after Late Senonian - post Khoman event and well preserved by Late Oligocene event. In this respect, Abu Roash Formation reached its peak of generation during the deposition of the Dabaa Formation of Oligocene age. In addition, the migration is of post Senonian and controlled by the Laramide structures. Khoman Formation has a very limited area of maturation locating the central part of the basin.

The paleo-tectonics, porosities, hydrocarbon saturation maps suggest that, the hydrocarbons have been migrated, accumulated and entrapped at the high areas of the Abu Gharadig basin.

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CHAPTER –I–

GENERAL GEOLOGIC SETTING

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