



Ain Shams University  
Faculty of Science  
Geology Department

# **The Middle-Late Cretaceous tectono-stratigraphic evolution of the Greater Abu Gharadig field, Northern Western Desert, Egypt**

*A Thesis Submitted*

*In Partial Fulfillment of the Requirements for the Degree of Master of Science in Geology*

By

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*B. Sc. in Geology, Ain Shams University*

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Geology Department  
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2017  
Approval Sheet

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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 the Degree of Master of Science in Geology. Besides the research work materialized in this thesis, the candidate attended eleven post-graduate courses for one academic year in the following topics:

1. Advanced Structural Geology
2. Geotectonics
3. Advanced Lithostratigraphy
4. Biostratigraphy
5. Photogeology
6. Geomorphology
7. Sedimentary Petrology
8. Sedimentation
9. Field Geology
10. Geostatistics
11. English Language

He successfully passed the final examinations in these courses held in September 2008

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Special thanks to my father and my brother "Shady" – May Allah rest their soul in peace.

## VITA

- 1984** Born in Cairo, Egypt.
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# **The Middle-Late Cretaceous tectono-stratigraphic evolution of the Greater Abu Gharadig field, Northern Western Desert, Egypt**

## **ABSTRACT**

Discovered in 1969, the Abu Gharadig (AG) Field was the first large hydrocarbon discovery in the Abu Gharadig Basin of the Western Desert of Egypt. Oil production began in 1973, with gas being brought into production in 1975. The field produces from three main Cretaceous reservoirs: (1) Lower Cenomanian Bahariya Formation; (2) Upper Cenomanian to lower Turonian Abu Roash "E"; and (3) Middle Turonian Abu Roach "C". Minor reserves occur in the Abu Roash "D" and Kharita reservoirs. The reservoirs are cut into several structural compartments by a number of WNW-ESE oriented faults.

The Abu Gharadig Basin is an E-W trending intracratonic basin, about 330 km long and 50-75 km wide. The basin is bounded on the north by the Qattara Ridge (also known as the Sharib-Sheiba High) and to the south by the Sitra Platform. It was initially formed as a large half graben system during the Jurassic time in response to Tethyan rifting and it continued to subside throughout the Cretaceous time. The half graben was subsequently inverted during the Late Cretaceous as part of the Syrian Arc deformation which affected much of northern Egypt at that time. The Mid-Basin Arch, the Abu Gharadig Anticline, and the Mubarak High are three NE-SW oriented main anticlines located within the basin that developed during the Late Cretaceous due to inversion of pre-existing Jurassic rift faults.

The Abu Gharadig anticline has an overall NE-SW orientation with a gentle plunge towards the NE. It is locally bounded by two NE-SW-trending faults; one bounds the southwestern limb of the anticline and the other bounds the northeastern side of the plunging nose. These faults control the asymmetry of the anticline which changes as we traverse the structure from SW to NE. Reverse offset along both of these bounding faults can be mapped seismically within the Cretaceous Alamein, Kharita, and Bahariya Formations. Fault propagation folding is developed towards fault tips within the Abu Roash Formation and Khoman Formation. Based on thickness changes and stratigraphic relationships, inversion seems to have started during the Santonian time and continued into the Campanian-Maastrichtian.

Some movements also took place during deposition of the Eocene Apollonia and Oligocene Dabaa Formations.

The North East Abu Gharadig (NEAG) Fold is another inversion anticline in the study area, located to the northeast of AG main fold. An inverted fault bounds its northern flank, and it has the same characteristics and evolution history and age like the AG main fold.

The NE part of the AG field dips simply toward the NW-SE oriented Sharib-Sheiba fault which shows normal offset, development of an early Cretaceous thickening wedge, and drag folding on its hanging wall contemporaneous with compressional folding along the main Abu Gharadig Anticline. This normal movement seems to have continued into Eocene and Oligocene times.

Furthermore, a series of WNW-ESE oriented normal faults dissect the Alamein to Abu Roash rocks and segment the southwest part of the Abu Gharadig field. These faults also appear to have been active during the inversion time and some of them cut upwards into the overlying stratigraphy.

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