Ain Shams University
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Structural Analysis of the Rosetta Fault, Offshore Nile Delta, Egypt

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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 Geology. Besides the research work materialized in this thesis, the candidate has attended five post-graduate courses of ten subjects for one year as follows:

1. Geol 601: Field Geology and Statistical Geology
2. Geol 613: Sedimentary Petrology and Sedimentation
3. Geol 624: Advanced Structural Geology and Geotectonics
4. Geol 628: Advanced Lithostratigraphy and Biostratigraphy
5. Geol 631: Micropaleontology/Micropaleontology and Paleoecology

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

In fulfillment of the language requirement of the degree, he also passed the final examination of a course in the English language.

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ABSTRACT

Rosetta fault is a major fault system affecting the offshore West Nile Delta basin. It consists of series of NE-SW and N-S fault segments and had a very complicated history of deformation. It is deep seated fault system that played a great role in the deposition and in the petroleum system of the area either as an element of hydrocarbon charge (migration pathway) and trapping or as element of failure of some traps due to its reactivation (multi-stage deformation). Rosetta fault system began its activity in Mesozoic time and continued till recent times. It shows different deformation styles since the Eocene till now. This study throws light on the deformation history of Rosetta Fault System and its control of the evolution of the west Nile Delta basin and hydrocarbon exploration in the area. Integration of detailed seismic interpretation of ten stratigraphic surfaces starting from Eocene to Pleistocene (Recent) and structural restoration of two seismic sections reveals the complex deformation history of Rosetta fault starting as a reverse fault at deeper stratigraphic levels (Eocene to Tortonian) due to compression then affected by Messinian unconformity. The Messinian section is affected by remarkable NNW-SSE normal faults forming rotated fault blocks due to gravitational movement at that time. Following that Rosetta fault has become an extensional normal fault indicating negative structural inversion since the Eocene time. There are gas escaping features (mud volcanoes and gas chimneys) created through complex deformation history of the study area leading to hydrocarbon trap failure on deep stratigraphic sections.

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LIST OF ABBREVIATIONS

CMR	Combined Magnetic Resonance (logging tool)
EMW	Equivalent Mud weight
ft	feet
HCPV	Hydrocarbon Pore Volume
K	Permeability
Km	Kilometer
Km^2	Square Kilometer
m	meter
MD	Measured Depth
MDT	Modular Dynamic Tester
MSL	Mean Sea Level
NDOA	Nile Delta Offshore Anticline
NN	Nanno Plankton
ϕ_o	Initial porosity at time of deposition
ppg	pound per gallon
PSI	Pound Per square Inch
SW	Water Saturation
TD	Total Depth
TDR	Time Depth Relationship
TVDSS	Total Vertical Depth Sub Sea
V_{int}	Interval Velocity
VM	Velocity Model
V_o	Interval Velocity at time of deposition
WDDM	West Delta Deep Marine