Faculty of science
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“Well logging Analysis and Seismic Interpretation on Cretaceous/Miocene Reservoir Rocks in West Esh El-Mallaha Area, Eastern Desert, Egypt”

THESIS

Submitted for the Master Degree of Science as a partial fulfillment for the requirements of the Master of Science

Geophysics Department

Faculty of Science

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قسم الجيوفيزياء

" تحليل تسجيلات الآبار والتفسيرات السيزمية لصخور خزانات عصور الميوسين والكريتاسى فى منطقة غرب عش الملاحة، الصحراء الشرقية، مصر"

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فى الجيوفيزياء

إبراهيم عطية محمد نصر

بكالوريوس فى الجيوفيزياء

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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 Geophysics.

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

1. Reservoir evaluation
2. Fluid dynamics
3. Advanced well logging
4. Physical properties of Rocks
5. Basin analysis
6. Formation evaluation
7. Subsurface geology
8. Geophysical exploration
9. Geophysical field measurements
10. Numerical analysis and computer programming

He successfully passed the final examinations in these courses.

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

The Gulf of Suez is considered as one of the major prolific oil provinces in Egypt. More than 837 exploratory wells were drilled to target different reservoir in that basin, with total footage of 6,831,842. The study area is located in the southwestern part of the Gulf of Suez rift, in the Eastern Desert. The present study deals with the structural development of the rift-related structures and its impact on the sediment distribution and facies variation around the study area.

In this study, the structure, depositional system, and the sequence stratigraphy of the West Esh El Mallaha field was interpreted using seismic data, well logs, Biostratigrapic-data, and drilling data to characterize the structural and depositional settings of the Nubia A and Nukhul Clastics reservoirs.

Petrophysical evaluation of the Nubia A and Nukhul Clastics reservoirs has been performed. The main goal of this approach is to evaluate the reservoir potential of the field through using different wireline logs and production data. This study identifies the different rock types that comprise reservoirs and non-reservoirs. The Nubia A reservoir is interpreted from 4 wells as a good quality reservoir rock with high average effective porosity reaching up to 21% and high average hydrocarbon saturation reaching up to 68%. Also the Nukhul Clastics reservoir recorded average effective porosity of 16.9 % and hydrocarbon saturation reaching up to 60%.

To demonstrate the structural setting of the study area, seismic data were interpreted. Three main seismic reflectors, which are the top Basement, top Nubia A, and top Nukhul Clastics were picked. The most dominant structures in the area are Clysmic and Cross faults which were interpreted as

normal and oblique slip faults respectively. These faults subdivided the West Esh El Mallaha field into two main structural blocks, Rabeh East and Rabeh blocks. The main importance of these faults is that they influenced the deposition of the pre-Miocene and Miocene formations in the study area.

Sequence stratigrapic analysis of the Nubia A reservoir, based on the well logs, seismic interpretation, biostratigraphic analysis, and drilling data shows that it comprises two different system tracts, the lower part of Nubia A Formation shows that the sandstones are fluvial facies as Low stand system tract. The upper part of the Nubia A Formation reveals that the sandstones are delta and fluvial/distributary channel facies and recorded in transgression system tract. The use of the biostratigraphic analysis dated the Nubia A Formation as Early Cretaceous (Aptian-Albian).

On the same approach, the Nukhul Clastics reservoir recorded a shallow marine and distal fan sand, and dated as Aquitanian – Early Burdigalian. Many authors argued about the age of the Nukhul Formation, because of rare fossils within it and they use the underlying volcanic intrusion to date it. The Nukhul Clastics is considered the first syn-rift reservoir in West Esh El Mallaha field.

Finally, from all the previous interpreted data sets, a geological model showing the structural and depositional environment for the study area is constructed.

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