AIN SHAMS UNIVERSITY

FACULTY OF SCIENCE

GEOPHYSICAL STUDIES IN SOUTH SIWA AREA, WESTERN DESERT, EGYPT UTILIZING SEISMIC INTERPRETATIONS AND WELL LOGGING ANALYSIS

BY

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A THESIS

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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 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- Seismology.
8- Engineering seismology.
9- Deep seismic sounding.
10- Structure of the earth.

She successfully passed the final examinations in these courses.

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

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ABSTRACT

The area of study is located in the westernmost part of the Egyptian Western Desert along the Libyan border south of latitude 28˚N, it is restricted between latitudes 28˚ 00` 00" N and 26˚ 30` 00" N and longitudes 26˚ 43` 00" E and 25˚ 00` 00" E. It covers an area of approximately 28,439 square kilometers.

South Siwa area is a part of a vast underexplored region of the Western desert of Egypt. It was developed during the Paleozoic and Mesozoic time and was probably a part of large Paleozoic basin combining the Kufra, Dakhla, and Foram basins. The study area, South Siwa, lies in what is known as “the great sand sea” and the terrain is covered by thick sand dunes varying in height and running in NNW-SSE direction.

2D seismic interpretation was carried out on the study area using thirty seismic lines to build a regional geological view about the area by constructing a series of seismic maps e.g. time contour map, depth contour map and isopach map. But as a result of the surface topography, most of the seismic lines were shot in NNW-SSE direction parallel to the longitudinal sand dunes. So, the obtained structural maps show poor image about structures in the subsurface.

Analysis of dipmeter data was done to give information about faults and unconformities in the study area. But due to a limited number of wells (only one well) in the study area a complete structure view is not available. Therefore another source of information is required; stripped-on gravity maps that were derived from the bouguer gravity map of the south siwa area, were constructed.

By combing information obtained from structural contour maps derived from seismic interpretation, structures obtained from dipmeter

analysis and matching them with stripped-on gravity maps, the structural configuration through the South Siwa area could be mapped. The deduced faults trends dissecting the area are: NNW-SSE, NE-SW, E-W, ENE-WSW and NE-SW.

A comprehensive well logging analysis was done for three wells to evaluate the various petrophysical properties (total and effective porosity, total and effective water saturation, hydrocarbon saturation, and shale volume) of possible reservoir intervals detected in the Upper Cretaceous (Cenomanian), Jurassic, Upper Carboniferous, and Lower Devonian sections in the study area.

This evaluation is anticipated to be guidelines for any future exploration in this area.