AIN SHAMS UNIVERSITY
FACULTY OF SCIENCE
GEOPHYSICS DEPARTMENT

Implementation of Geophysical Techniques to Evaluate Hydrocarbon Potentialities in Some Pliocene and Cretaceous Reservoirs: North Sinai - Offshore Mediterranean

A Thesis Submitted In Partial Fulfillment of the Requirements for the Ph.D. Degree of Science in Geophysics

BY
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إهداء

لله الحمد كما ينبغي لجلال وجهه وعظيم سلطانه وله الحمد والشكر على نعمه التي لا تعد و لا تحصى...أهدى هذا العمل إلى روح أبى العزيز إيمانا بكونه سبب وجودى فى الحياة و اعترافا بفضله علي رحمه الله...و إلى أمى الحبيبة الغالية إعترافا بافضالها الكثيرة علي و العطاء الدائم الذى لا ينضب و ادعو الرحمن الرحيم ان يحفظها ويطيل في عمرها...و إلى زوجتى الحبيبة الغالية و شريكة الحياة التى لم تتوانى عن مساندتى و بث روح الهمة و العزيمة فى نفسى ...و إلى اخوتى الاعزاء الاحباء...و إلى كل من له فضل في تعليمي...إلى كل هؤلاء اهدي ثمرة جهدي المتواضع.

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ABSTRACT

The aim of this study is to evaluate the structure for the shallow and deeper reservoirs using the available 3D seismic and borehole data to delineate the possible hydrocarbon prospects and generating amplitude maps. On the other hand, the study of the possible amplitude bright spots to indicate the gas anomalies within the study area and computing of the standard post-stack AVO attributes in order to identify AVO anomaly classifications. The AVO inversion and acoustic impedance are computed to delineate the elastic parameters, such as (porosity, fluid and reservoir types). Integrating results of the structure depth maps and amplitude maps with the AVO-attributes and inversion were performed to delineate the hydrocarbon potentiality, creating prospect inventory map and to delineate the possible leads. Prospects and evaluating the potential targets for multiple reservoirs as Pliocene, Miocene, Oligocene, Eocene, Cretaceous and Jurassic were performed. As consequence of the interpretation performed, the basic results characterizing the seismic-geological model of the study area have been obtained as the structure geometry of the area, based on key reflectors and horizons related to productive and prospective sediments. The structure of the Lower Cretaceous sand reservoirs are discovered by Mango-1 well. Based on this study, I performed the potential of the Pliocene-Pleistocene targets related to deepwater fans. In the northwestern and northern parts in the Upper Miocene section, I have delineated the possible organogenic carbonate buildups. In the southwestern part in the Lower Miocene reservoir, I have mapped a prospective deepwater fan.

For new hydrocarbon discovery related to the possible Upper Miocene organogenic carbonate buildups, I recommend to drill exploratory well in the northern part of the study area with target depth 2,600 m.

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