AN INTEGRATED SEISMO-FACIES AND SEISMO-TECTONIC STUDY OF THE NILE DELTA OF EGYPT, UTILIZING COMMON-DEPTH POINT SEISMIC REFLECTION DATA

A THESIS

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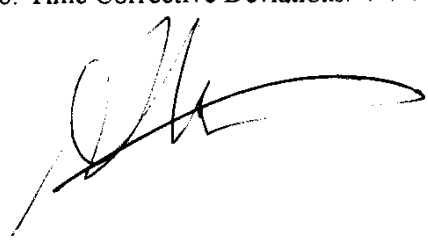
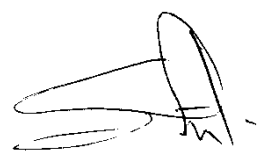
LIST OF CONTENTS





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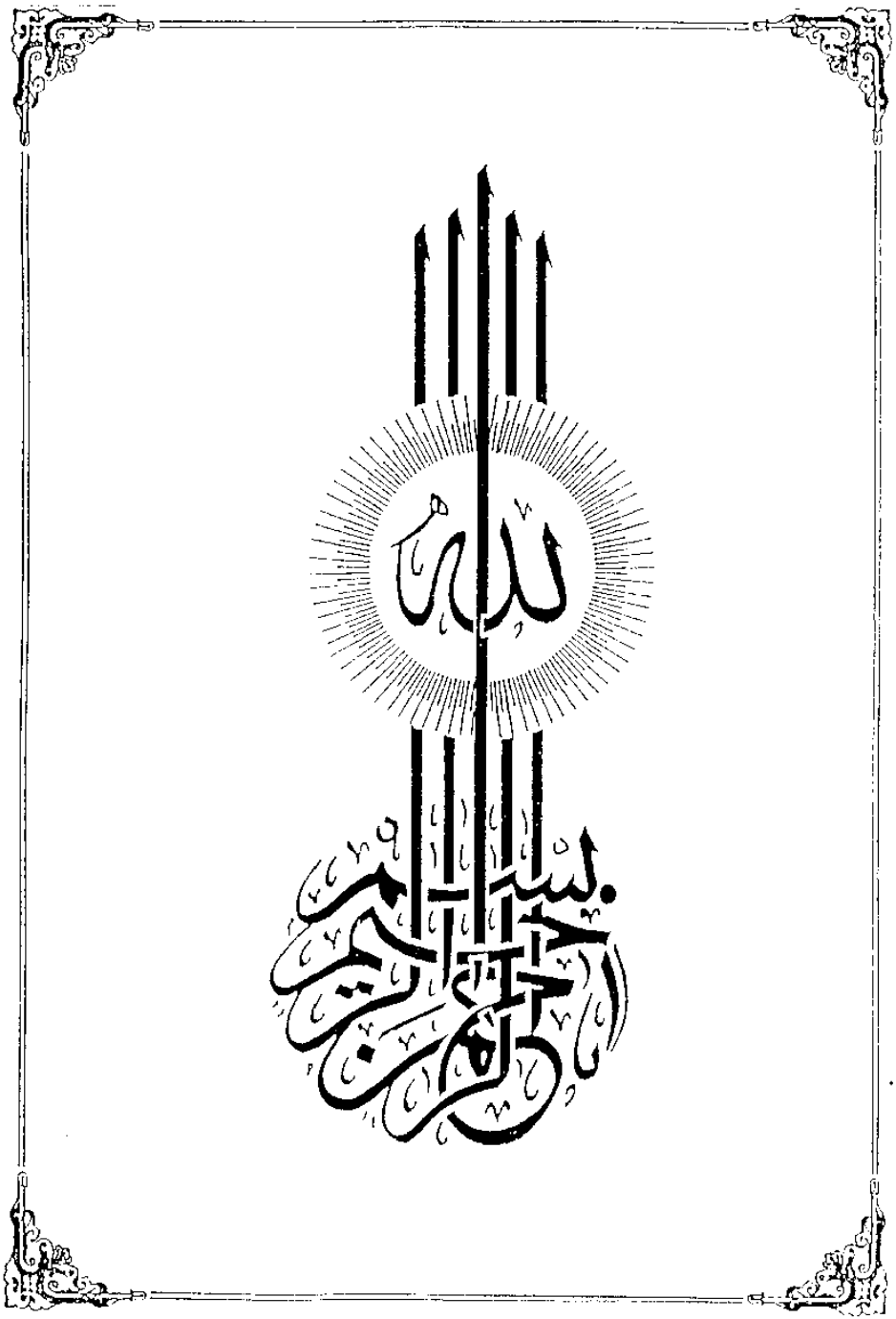

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LIST OF TABLES

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ABSTRACT

The present thesis is devoted to the geophysical interpretation of the seismic data in the Nile Delta area,to delineate the physical ,structural and stratigraphical features affecting the different litho-stratigraphic units composing the sedimentary section .

The available data utilized are a collection of geological and geophysical information. However ,the geological data are in the form of lithologic logs of nine wells scattered in the study area .Moreover, the geophysical data are in the form of sixty two seismic lines and the comparable velocity measurements needed for the seismic work.

Root mean square velocity is related mathematically to the average velocity through the velocity heterogeneity factor .Root mean square velocities and average velocities of a number of wells are calculated and plotted to define the analytical relation between them.The drift between these velocities is a measure for the heterogeneity may exist between the lithologic contents.Average velocity gradient maps for the tops of El-Wastani ,Kafr El-skeikh,Abu Madi,Qawasim,Sidi Salem and Qantara Formations are drawn and analyzed. Consistent style of variation of the high and low velocity anomalies is found.Root mean square velocity profiling is carried out ,from the stacking velocities of a number of seismic lines.These profiles reflect the subdivision of the evaluated section into a number of tears expressing the associating variations in the encountered stratigraphy of the shallow section.Moreover ,the drift between time -depth curves derived from velocity analysis and these derived from well data are calculated and plotted for the wells:Kafr EL-Sheikh-1,Sidi Salem - 1,Qawasim-1 ,Abadiya-1 and North Bilqas-1.The vertical drifts of the wells are followed laterally through a number of time deviation maps of the fore-mentioned rock units.These time deviations can be used for justifying the RMS velocities of the stacked sections in the areas (between wells)of no available velocity measurements needed for calculating the optimum average velocities.

The seismic reflection data are interpreted to establish the structural features affecting the relatively shallower and intermediate sections of the Nile Delta of Egypt.These features are mapped on the tops of Masajid,Nubia Complex,Chalk,Qantara,Sidi Salem,Qawasim ,Abu Madi,Kafr EL-Sheikh(lower and upper parts) and EL-Wastani formations.The mapped structural elements are varied

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from folds (anticlines and synclines) and faults of the normal type.The deduced structural inferences are ranged in their trends from being NE-SW in the Middle- Late Mesozoic,to be NW-SE in the Early Tertiary and to be E-W in the Late Tertiary.

Added to these ,five seismic sections CM-223 , Man-401,K-S-419,Man-467 and Man-485 are selected for presenting the growth influence and branching effect accompanying the prograding of the investigated area,Time plots of the five models are established to show the preliminary situation of the tops of the selected formations for the studied.Velocity models of these sections are plotted to exhibit the constant interval velocities needed for the conversion of time models into depth models.Ray-tracing plots of the five models are constructed to reveal the degree of success in selecting the proper velocities and to execute the needed adjustments of these velocities for more correct situation of the modelled horizons.Finally ,the depth model of the five seismic sections are established to reflect the depth migrated seismic sections with the structural styles of the studied area.

The seismic stratigraphic analysis procedures,involving seismic sequence analysis,seismic facies analysis and seismic unit analysis where proceeded in order to subdivide the Cretaceous to Recent sedimentary section into seismic stratigraphic units and then ,to detail their stratigraphic manifestations. These units essentially are differed in their reflection characteristics and stratigraphic expressions.Accordingly four sets of maps where sketched for each of these units.These are the seismic reflection pattern,the lithology distribution maps,the seismo-facies types and the time - thickness maps.All these maps were used to infer the depositional environmental conditions of the investigated rock units.In this respect,the seismic reflection characteristics are ranged from parallel to divergent to sigmoid to oblique to fill to chaotic .Also,the lithology distributions are varied from clay to sand to shale to limestone.Added,the time thicknesses are ranged from 50 ms to 1200 ms .Moreover the depositional environments are varied from continental to littoral to neritic to bathyal to abyssal.

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