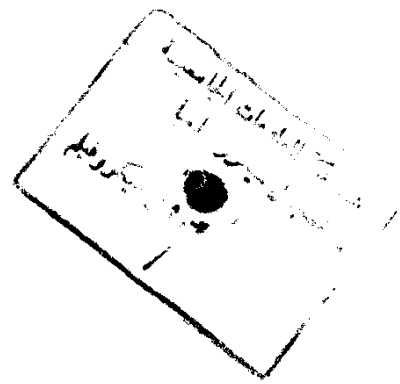
STRUCTURAL ANALYSIS OF THE NORTH EASTERN DESERT AND NORTH AND CENTRAL SINAI, EGYPT

Ph. D. Thesis
in
Geology



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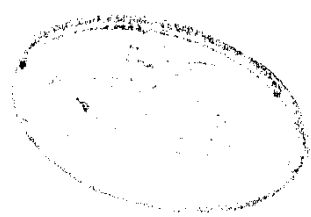

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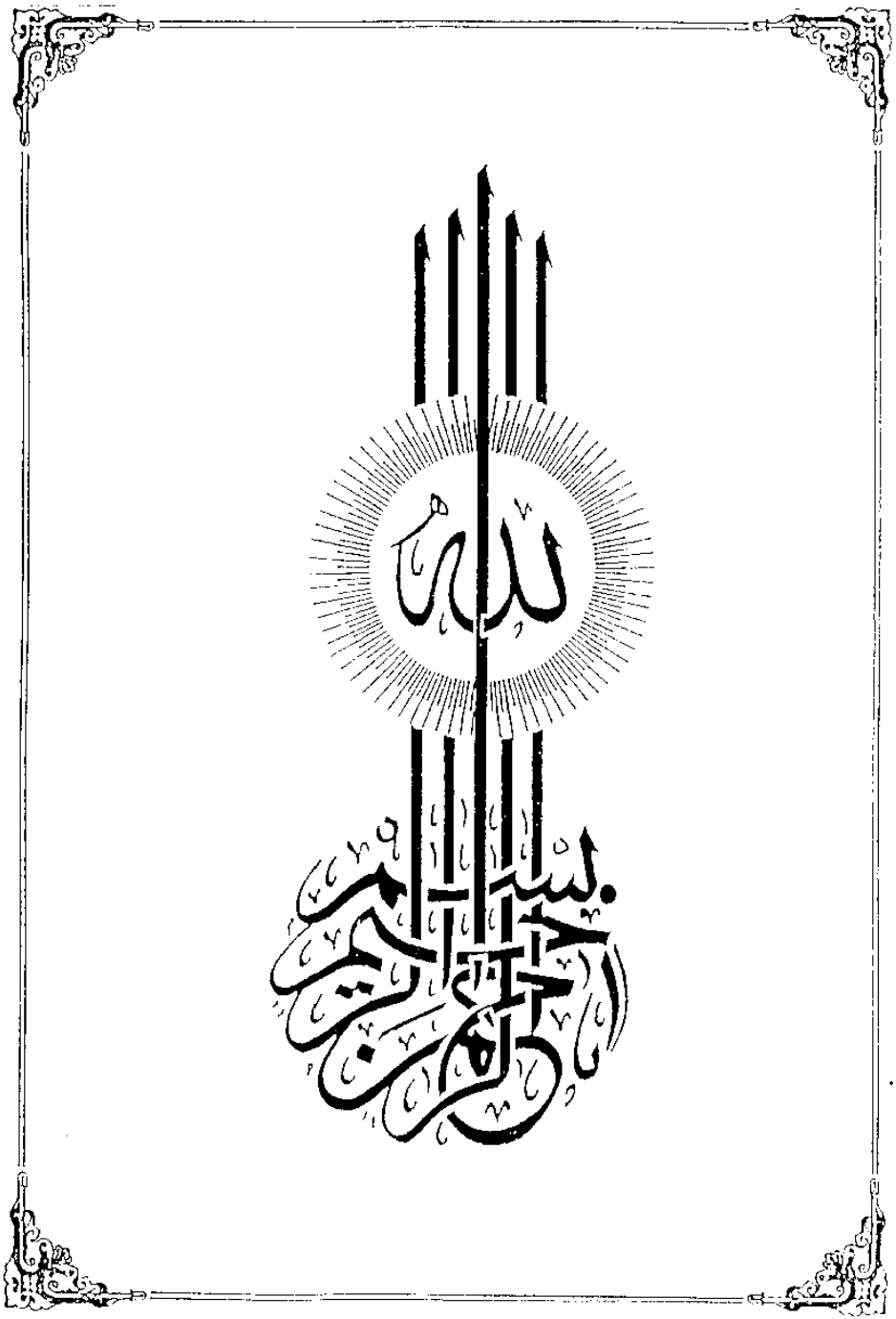

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CONTENTS

ABSTRACT

Detailed structural study of central Sinai and the north Eastern Desert and compilation of the results of the earlier study of north Sinai indicate the effect of four deformations on old pre-existing faults formed at the Late Triassic-Early Jurassic opening of the Neotethys and formation of a passive continental margin in north Africa. The earliest rejuvenation of these faults (D1 deformation) is Late Cretaceous (Early Late Senonian) and proceeded by dextral wrenching leading to the development of right-stepped en echelon folds above these subsurface faults in addition to large asymmetric folds (e.g. Gebels Yelleq, Maghara, and Halal folds) in the intervening areas. These folds form a continuous belt in north Sinai and the north Eastern Desert. This folding also affected the area now occupied by the northern part of the Gulf of Suez.

The second rejuvenation of the pre-existing faults (D2 deformation) is post-Middle Eocene–pre-Early Miocene and is manifested by dextral strike-slip movement on the Themed Fault. This deformation is probably related to stresses transmitted across the Early Mesozoic continental margin of Africa.

The third (D3) deformation is manifested in the Cairo-Suez district and proceeded by rejuvenation of the E-W oriented pre-existing faults by dextral transtension leading to the development of belts of left-stepped en echelon normal faults above the pre-existing faults. Also, NW-SE oriented normal faults were formed at the same time. Different structural styles in the Cairo-Suez district are related to the difference in mechanical properties of the rocks in the northern and southern parts of the district.

The D4 deformation represents the last recognized phase of rejuvenation of the pre-existing faults in northeast Egypt. This deformation is post-Early Miocene and proceeded by dextral wrenching in the Sinai "hinge belt" and by continued slip on the normal faults of the Cairo-Suez district. The dextral wrenching in the Sinai "hinge belt" is indirectly related to the slip on the Dead Sea Transform whereas the faulting in the Cairo-Suez district is related to continued opening of the Suez rift.

The structural framework of northeast Egypt has a direct effect on its hydrocarbon potentialities. Promising structural traps in this region are related to the Late Cretaceous folding. Several areas are recommended for hydrocarbon exploration where such folds are expected in the subsurface. Good source, reservoir, and cap rocks also encourage the search for hydrocarbons in the proposed areas.

LIST OF FIGURES