GEOLOGICAL AND MINERALOGICAL STUDIES ON SOME GYPSUM-ANHYDRITE DEPOSITS OF WEST SINAI AND THEIR ASSESSMENT

THESIS

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Ain Shams University

BY

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N O T E

The present thesis is submitted to Faculty of Science, Ain Shams University in partial fulfilment of the requirements for the M.Sc.Degree in Geology. Besides the research work carried out in this thesis, the candidate has attended nine graduate courses for one year in the following subjects :

1- Cartography and geological mapping.
2- Tectonic setting of Egypt.
3- Geologic laboratory techniques.
4- Igneous rocks.
5- Sedimentary rocks.
6- Metamorphic rocks.
7- Mineralogy.
8- Geochemistry.
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He has passed successfully the final examination of these courses held in March, 1982.

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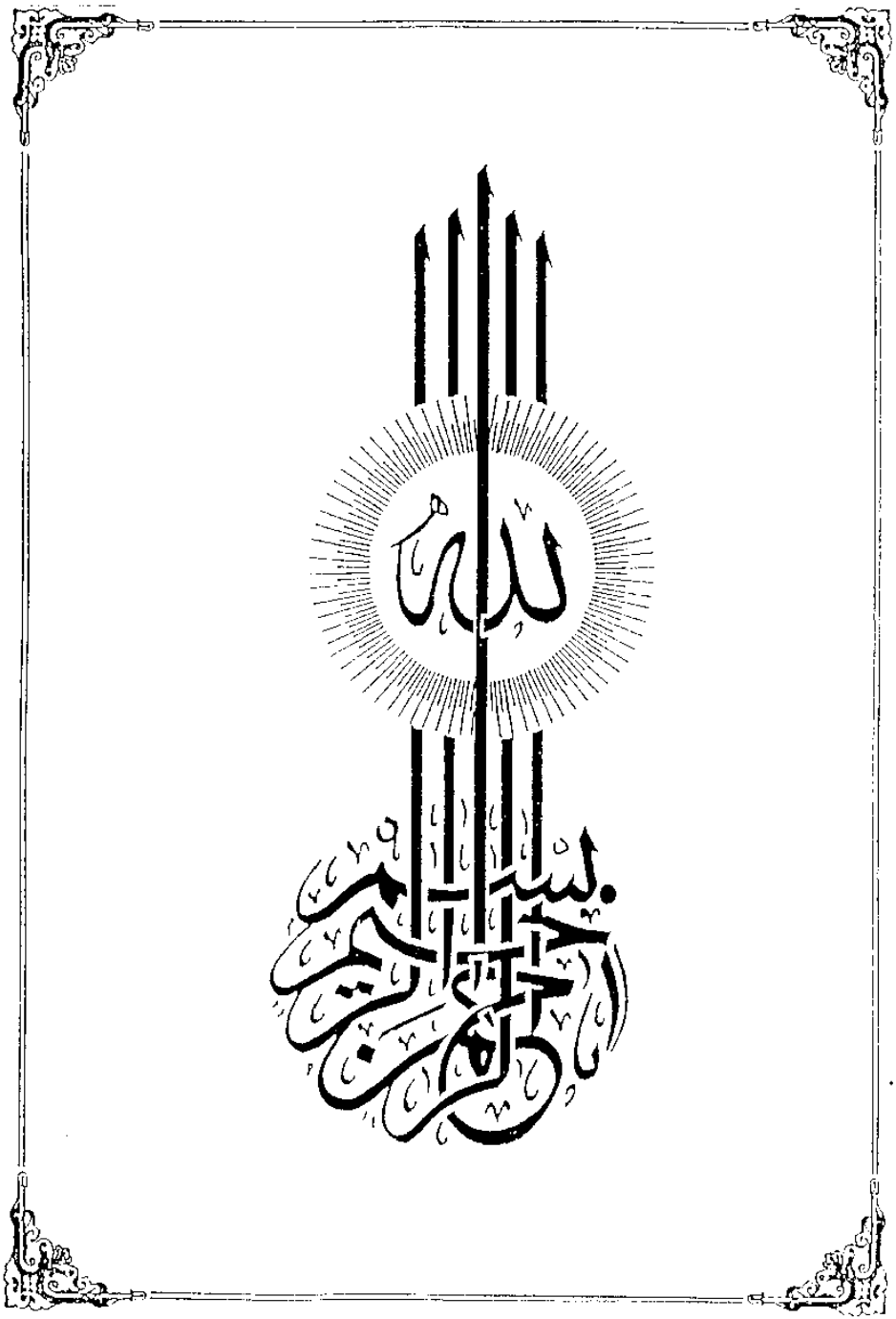

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I N T R O D U C T I O N

Extensive economic gypsum-anhydrite deposits are widely distributed all over Egypt, the most important of which occur along the coastal plain of the Red Sea, along the Mediterranian coastal plain (e.g. El Hammam, El Gharbaniat, El Omayed, Alam El Milh and Baraquan), along the Nile Valley and Fayum (e.g. Helwan, El Rous, El Saff, Gerza), in the Suez Canal zone (e.g. El Riena, El Ballah) and in West Sinai (e.g. Ras Malaab, Gebel Khoshera, Wadi Wardan). The deposits at these localities are related either to Middle Miocene, Plio-Pleistocene or Pleistocene times.

Location :

Ras Malaab and Marwet El Khoshera deposits represent important resources of economic gypsum-anhydrite in West central Sinai. The distribution of these deposits is mainly governed by the extension of the Middle Miocene sediments. These deposits have been the subject of few geological investigations and limited feasibility studies. Therefore, the present work aims at studying the mode of occurrence, the mineralogy and the chemical composition of these gypsum-anhydrite deposits, together with an assessment of their industrial potentialities.

The gypsum-anhydrite deposits at Ras Malaab have been quarried since 1950, to be mainly exported to the Far East as raw material. They were exploited from eight quarries scattered in an area of about four square kilometres. The locality

(Fig. 1) lies at about 45 km NW of Abu Zenima within the following coordinates :

Latitudes 29 15' 30" and 29 16' 40" N and
Longitudes 32 53' 45" and 32 54' 45" E.

The gypsum-anhydrite deposit at the second locality under investigation (known as Marwet El Khoshera, at the Southwestern limit of Gebel Khoshera, some 60 km NW of Abu Zenima, Fig. 1) was surveyed for the first time by the Arab Consulting Bureau (1982)*. It occupies an area of about nine square kilometres, bounded to the South by Wadi Wardan, to the East by Wadi Nikheila, to the West by El Shatt - El Tor asphaltic road. The investigated area lies within the following coordinates :

Latitudes 29 24' 00" and 29 20' 30" N and
Longitudes 32 54' 55" and 32 58' 30" E .

Previous Studies :

The geological interest in the Gulf of Suez region began since the middle of the Nineteenth Century (Schweinfurth, 1864 cited in Said, 1962). Most of these geological studies deal with stratigraphy and structural evolution. In particular, the Miocene stratigraphy in the Gulf of Suez region gained its importance with the continuous research for oil and its discoveries in this region . Many published and unpublished (internal reports of the oil companies) literature that

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* Personal cummunication.

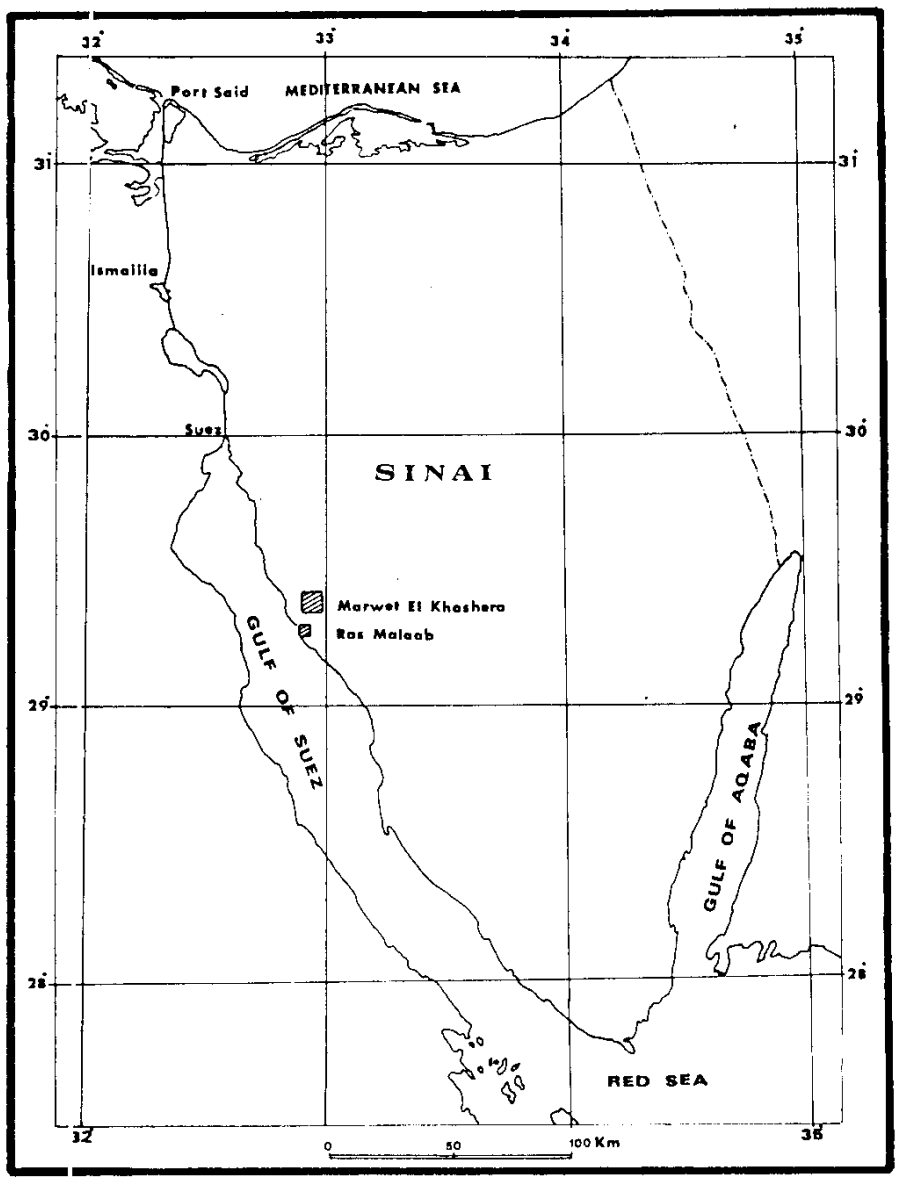

Fig:1. Location Map

deals with the classification of Miocene rocks in this region are therefore available. Most important of these works belong to Barron (1907), Ball (1916), Hume et al. (1920), Fourtau (1920), Moon and Sadek (1923, 1925), Macfadyen (1930), Heybroek (1949, 1965), Stainforth (1949), Farag and Shata (1955), Said and Basiouni (1958), Sadek (1959), Said (1961), Hantar (1965), Souaya (1966), Ghorab and Marzouk (1967), the Stratigraphic Sub-Committee of the National Committee of Geological Sciences of Egypt (1974), and Renolds (1979). These studies focus on the lithostratigraphy, biostratigraphy and paleontology of the formations along the Gulf of Suez.

It is intended here to present a summary of the Miocene stratigraphical studies carried out on the Gulf of Suez region with special emphasis on the central parts of West Sinai as they include the investigated gypsum-anhydrite deposits. Other previous studies concerning the particular topics of gypsum-anhydrite deposits will be treated separately in each chapter of the present work.

Moon and Sadek (1923, 1925) gave a detailed description of the Miocene stratigraphy of the Gulf of Suez region; the work constitute the basis for the present classification of Miocene sediments. The type section for the Miocene succession exposed at Wadi Gharandal in West central Sinai has been fully described and subdivided by these two authors. It has been divided into three main groups, the upper group of limestone with Nullipores, the middle gypsum and marl

series, and the lower alternating grits and clays. A flint or basalt conglomerate always intervenes between the base of the Miocene and the top of Eocene strata, indicating a break in the continuity of deposition. This unconformity is not manifested by any appreciable difference in either amount or direction of dips. These Miocene sub-divisions, adopted by Moon and Sadek, though purely lithological, have proved to be time stratigraphic units as well. Thus, the lowest clays with alternating grits were assigned to Burdigalian or Lower Miocene, while the overlying units could be related to Vindobonian or Middle Miocene time.

The summary of the Miocene classification at Wadi Gharandal as given by Moon and Sadek (1923) and the characteristics of each subdivision are given in pages 5 & 6.

According to Moon and Sadek (1925) the Miocene succession at Gebel Khoshera area is closely comparable to that in the area of Wadi Gharandal mentioned above, except for the occurrence here of two different sections of younger Miocene rocks. The dividing line between both sections is the fracture referred to as Wadi El Nikheila fault (or Wadi Hawara fault according to Sadek, 1959) bordering the main Gebel Khoshera ridge on the west. This fault runs in a NNW-SSE direction. To the west of this fault, the Miocene succession resembles in all its details that of Wadi Gharandal area, of which it forms its northern continuation. To the east of the