I.1- INTRODUCTION

The studied area lies in the central portion of the Northern Western Desert of Egypt between latitudes 28 00 and 30 00 N, and longitudes 27 00 and 30 00 E, Fig.1. It covers a total surface area of about 5600 km., with the aim of determining its subsurface structure and solving some of the geological problems that are most intersting to both geologists and geophysicists. The general geologic setting of the area using the geological significance of gravity data, including Bouguer, Reginal, and Residual anomulies .

Also, it is believed that quantitative analysis would be of great interest if it were devoted to :

1- Determination of the depth to the top of the basement complex and the approximate thickness variation of the sedimentary section in the area.

2- Determination of the possible lithological variation within the basement complex itself.

3- The evaluation of the concealed structure of the area under study, with emphasis on fault parameters, namely, the amount of throws, dips, length and the depth to its upper and lower surfaces.

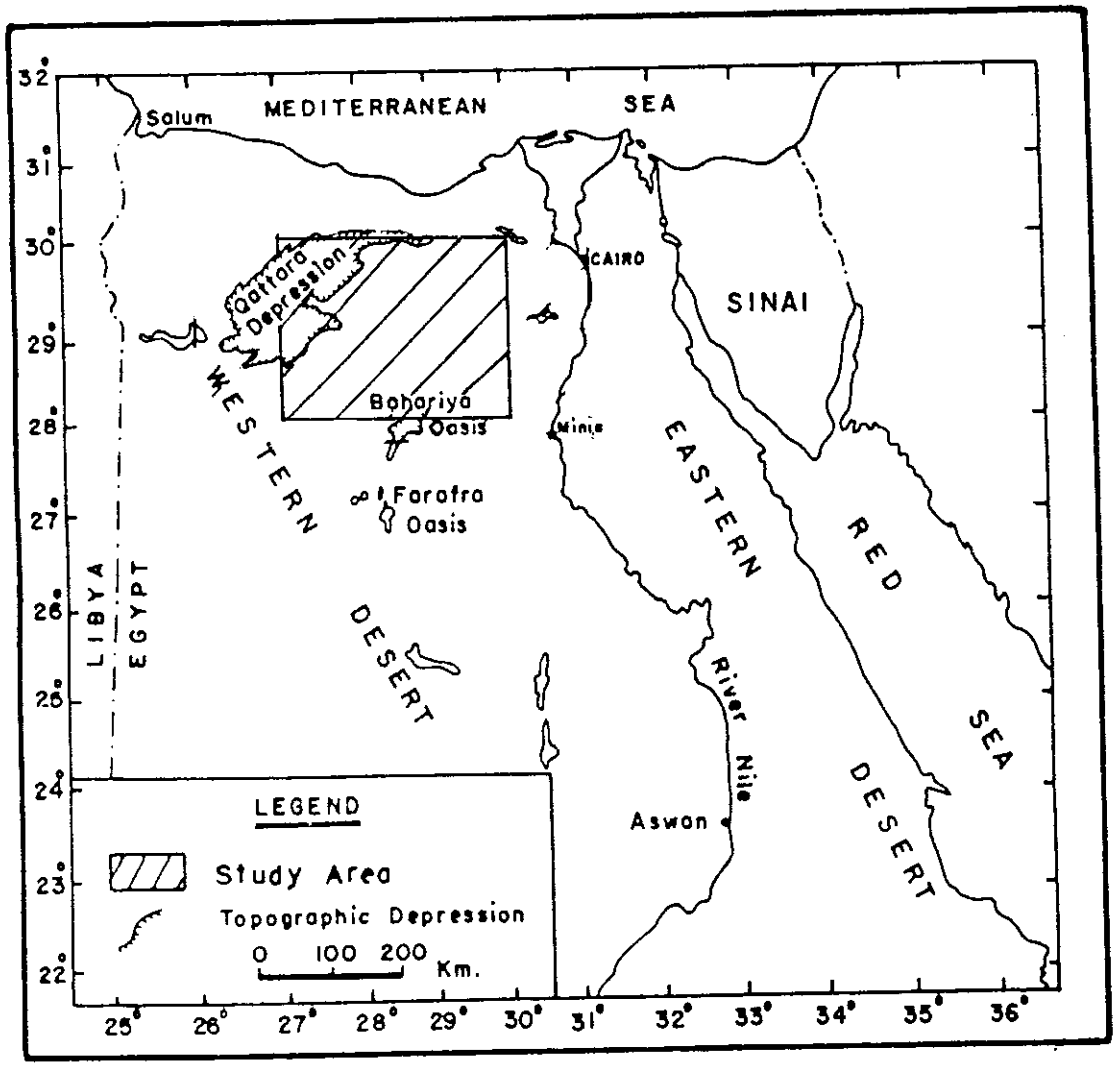

Fig. 1. Location map of the study area.

I-2 Purpose of this work :

The present geophysical study is mainly carried out to evaluate subsurface structure and tectonic set up of the study area, using the available gravity data (Bouguer anomalies), drill hole information and published material.

The data used are the following :

1- The Bouguer anomalies map, compiled by (G P C) in 1984, with scale 1:500,000 and contour interval 2 milligal (Fig. 7).

2- Boreholes drilled in the area and near-by areas, by the different oil compainies that worked or still working in the Western Desert of Egypt.

3- Maps representing the geological and structural interpretation of Landsate Satellite imagery and field investigation El-Shazly et.al.,(1980).Maps are in scale 1 : 1000,000.

The Bouguer anomaly map is subjected to qualitative and quantitative techniques of interpretation.

The qualitative study is mainly devoted to detect the major structural elements in the form of uplifts, depressions, regional ridges and faults through the study of the widths, amplitudes, gradients, directions and areal extensions of the recorded anomalies.

On the other hand, a quantitative interpretation included the folowing techniques :

1- Trend analysis of gravity map,to delineate the structural elements, especially faults, affecting the area under study.

2- Calcualtion of the regional gravity to delined the deep anomalies, and construction of the crustal thiekness map of the area.

3- Calculation of the residual gravity map of the area to delineate the shallow anomalies occuring within the sedimentary cover or at the surface of the basement complex.

4- Construction of the basement relief map, to throw light on the thickness of the sedimentary succession.

5- Correlation between surface trends resulting from Landsate Satellite imagery and subsurface trends resulting from the gravity maps were done.

I. 3- Previous gravity work :

The North Western Desert of Egypt, in which the study area is included, is an important province in Egypt for petroleum exploration. For this reason, the area has been covered at scattered localities, different petroleum companies, from 1937 till now. Intensive geophysical studies has been carried out in different parts of the Western Desert. The gravity survey is the oldest geophysical tool used in Egypt since 1922, its rather

history flourished in many periods in the different exploration areas as it was and still, one of the most simple and fundamental geophysical investigation approaches. El-Gamili, (1968) Bayoumi, El-Gamili, (1969), Bayouni, Sabri (1969) Bayoumi, El-Gamili, (1970), Bayoumi, Awad, (1972), Khalil, Mofty (1972), Refai et.al., (1973), Bayoumi, et.al., (1974), Awad (1975), Othman, (1975), Refai, et.al., (1975) and Sharaf, (1984) evaluate the subsurface structural features and throw lights on the fault systems and their vertical continuation in defferent parts of the northern Western Desert.

Results of their studies show the following points :

a- The Northern Western Desert is structurally characterized by different systems of dislocation zones. The major trend paterns of such zones concide fairly well with the deformation trends of the Mediterranean, Gulf of Suez and Gulf of Aqaba. These possibily result from the tectonic activities affecting the earth's crust during both the Precambrian and Post-Cretaceous periods.

b- Depth to the basement surface in the different areas ranges from about 500 m in the southern parts, and about 5 km. in the northern parts. Local uplifts and basins, that are considered as anticlinal and faulted steps, were presented in the different areas.

c- Lithological variations not only within the sedimentary section but also within the basement complex itself can be also outlined from the analysis of gravity data of different areas in the Northern Western Desert.

Refai, et.al.,(1973), Sayed, (1977), Riad, et.al., (1978), Riad, et.al., (1979), Tealeb, (1979) and Meshref et.al., (1979) identifies the main tectonic trends and construct tectonic maps for the basement surface in different area in the Northern Western Desert from the available geophysical data. As a result of these studies the following conclusions could be achieved :

a- Basement tectonic trends, present in the northern part of Egypt are five, namely - E-W (Mediterranean), N 45 W (Suez trend), N 15 - 30 E (Aqaba trend), 45-60 E (Qatara trend), and the N - S (Auleatic).

b- The sedimentary cover is characterized by the presence of a wide spectrum around the suez trend (N 35-55 W). All basement trends are recorded in the sedimentary cover which indicate the control of the basement tectionics on the overlying sediments (Riad et.al., 1983).

c- North Egypt may be subdivided into the following four tectonic zones : Gulf of Suez, Bahariya - North Sinai, Qattara Depression and northwest of the Western Desert (Riad et.al., 1983).

Riad (1977), Sayed, (1977), Riad et.al., (1978) Riad et.al., (1979), Darwish, (1979) and Riad et.al., (1982) used the available Bouguer anomaly maps in determining the fault systems and shear zones in the different parts of the North Western Desert.

From their studies, two sets of shear zones have been recognized:

a- The first set of shear zones trending in N-W direction. It probably represents the suez right lateral shearing supposed to exist according to Moody's model (Halsey and Gardner, 1975). This shear direction was reported in the Gulf of Suez area. Faults of NW - SE direction were reported by El-Shazly et.al., (1976), to be strike slip faults of right lateral type.

b- The second set of shear zones strike in NE directon. it is believed that this set represents the Aqaba shear direction.