Ain Shams University
Faculty of Science
Geophysics Department

جامعة عين شمس
كلية العلـــــوم
قسم الجيوفيزياء

GEOPHYSICAL AND GEOLOGICAL IMPLICATIONS FOR MINERALS EXPLORATION AT OLD MINE AREA, WEST WADI DARA,NORTH EASTERN DESERT, EGYPT

A Thesis Submitted in Partial Fulfillment

For The Requirements of M.Sc. Degree

In Geophysics

By

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To

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التضمينات الجيوفيزيقية والجيولوجية للتنقيب عن المعادن فى منطقة المنجم القديم غرب وادى دارا شمال الصحراءالشرقية , مصر .

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فى العلوم - الجيوفيزياء

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عايد محمد بخيت قناوى

إلى

قسم الجيوفيزياء، كلية العلوم، جامعة عين شمس

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NOTES

The present thesis is submitted from **Mr.** ***Ayed Mohammed Bakhait Kenawy*** to the Faculty of Science, Ain Shams University in partial fulfillment for the requirements of M.Sc. Degree in Geophysics.

Beside the research work materialized in this thesis, the candidate attended and successfully passed post-graduate courses for one academic year in the following topics:

1- Geophysical field measurements.
2- Numerical analysis and computer programming.
3- Potential theory.
4- Magnetic methods.
5- Gravity methods.
6- Shape of the earth.
7- Plate tectonics.
8- Electromagnetic and telluric current method.
9- Electrical methods.
10- Radiometric methods.

He has successfully passed the final examination of these courses. In addition, the student has successfully passed the language examination.

Head of Geophysics Department

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ABSTRACT

The study area is located in the North Eastern Desert, Egypt, and lies between latitudes (27° 54` 00" and 27° 56` 00" N), and longitudes (32° 50` 30" and 32° 52` 00" E). The study area is high relief and dissected by the main long and wide Wadi namely Wadi Dara, which extends from the study area to Gulf of Suez. The area, covers about 0.66 km^2 and is covered by some Precambrian rocks, the oldest of which are the metavolcanics which are intruded by diorite-granodiorite complex and subsequently by unmetamorphosed Dokhan volcanics. Dykes and quartz veins also occur. The diorite and granodiorite are considered the main host rocks of copper mineralization.

In the present study, a detailed ground geophysical exploration work was applied to delineate the local geology, structural framework and to define the conductive zones of the prospect area. Detailed ground magnetic, Gradient Resistivity/IP and self-potential surveys have been carried out in the prospect area on grid lines. The field measurements were taken along 22 profiles which have N 45º W direction on a grid pattern, with profile spacing of 50 m and station separation of 25 m. Beside, 5 Resistivity/IP 2-D Geo-electrical Sections. Profiles were chosen to follow anomalous zone at deeper depths. The data have been treated qualitatively and quantitatively by applying various interpretation techniques. Different types of maps were constructed to delineate and locate structures and potential of mineral deposits. Some promising sites were selected to more detail investigation. The survey results indicate that the source of copper mineralization resulted from the hydrothermal solutions which invaded through fractures and no indication for mineralized ores bodies.

For magnetic depth calculation, two techniques (As and SPI) were used to analyze the old mines, west Wadi Dara magnetic data as a guide for structural interpretation and basement configuration. These are proved as efficient tools to map the location of magnetic structures such as faults and contacts. The results

of these techniques are closed to each other, which are ranging in depth between zero and 90m. The north western part of the study area is shallower than the other parts. The source depths meet the out crops of metasomatized granodiorite rocks. While, the south eastern part of the two maps shows the deepest sources having about 90 m, where are concealed by Wadi deposits.

The structural lineaments at shallow and deep depths of the prospect area were interpreted from the residual and regional magnetic maps. Statistical trend analysis is achieved here for the resolution of the azimuths and lengths of the outlined interpreted lineaments. The Azimuth- length frequency diagram of the regional magnetic map shows that, the NNW-SSE, and ENE-WSW trends represent the deep structures. While the azimuth- length frequency diagram of the residual magnetic map shows the shallow structures affected on the prospect area having trends NW-SE, NNW-SSE, ENE-WSW, E-W, N-S and NNE-SSW arranged in decreasing older of magnitude.

The SP survey indicates the presence of some relatively low to medium anomalies in the study area.

The main results obtained from the application of the 2D resistivity/IP imaging can be concluded that most profiles run from SW to NE with maximum depth 47m. The location of the profiles is quite conformable with the anomalies derived from the SP, resistivity and chargeability maps. Where there are many conductive zones, these have low resistivity range between (50-600 Ohm-m) and high chargeability greater than 12 mV/V these zones are considered mineralized zones which have 1% volume concentration of a variety of conductive ore minerals. This indicates the source of copper mineralization resulted from the hydrothermal solutions which invaded through fractures and no indication for mineralized ores bodies at depth of about 50m.

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CHAPTER I

INTRODUCTION

1.1. General

The investigated Wadi Dara area is located at the northern part of the Eastern Desert of Egypt (Fig.1.1). The area is covered by Precambrian rocks, the oldest of which are the meta-volcanics, which are intruded by diorite-granodiorite complex and subsequently by un-metamorphosed Dokhan volcanics. Dykes and quartz veins also occur. The diorite and granodiorite are considered the main host rocks of copper mineralization (Bishady et al., 2001).

Geophysical surveys are made in the Wadi Dara area. Detailed ground magnetic, self-potential, induced polarization (IP) and electric resistivity measurements are focused of the study area to locate new deposits of mineralization and the possible trend of mineralization, hosted primarily in shear or alteration zones within volcanic rocks in the studied areas. The study area is shown in figure 1.1. The area is covering about (0.66) square kilometer, where previous reconnaissance geologic studies by (Atalla ,1983;Abd El Tawab.1990;Al-Hawary and Shabaan 1994; Bishady et al., 2001and El-Boghdady et al., 2003) referred to conditions favorable for the occurrence of copper mineralization and its associated minerals.

1.2. Location of the study area:

The area under study is located at the North Eastern Desert, Egypt, and lies between latitudes (27° 54` 00" and 27° 56` 00" N), and longitudes (32° 50` 30" and 32° 52` 00" E). The study area is high relief and dissected by the main long and wide Wadi namely Wadi Dara, which extends from the study area to Gulf of Suez (Fig.1.2).

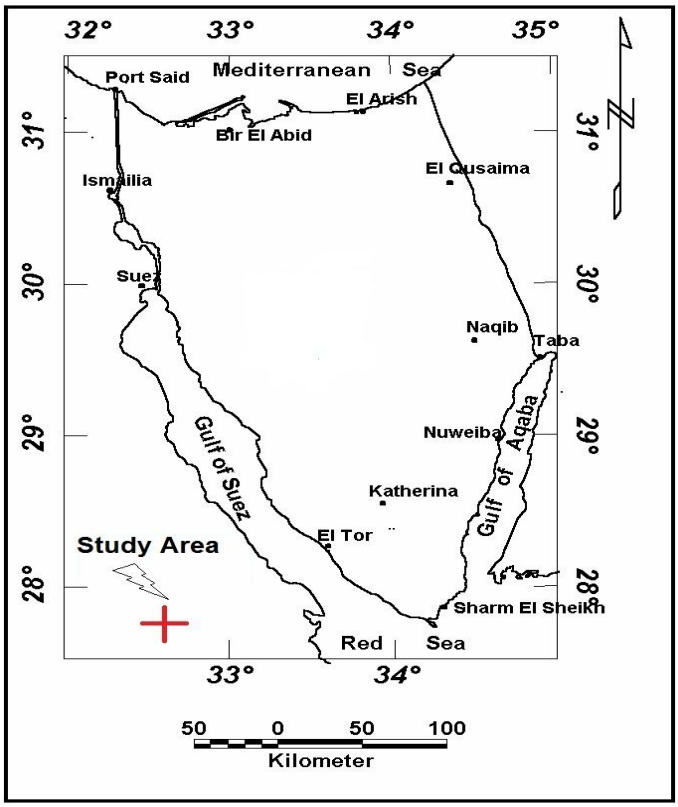

Fig.(1.1): Location Map of The Study Area, North Eastern Desert, Egypt.

1.3. Accessibility:

The area under consideration can be reached through the main asphaltic road running parallel to the Gulf of Suez. It lies about 45 km south Ras Gharib City. Wadi Dara extends about 55 km from Gulf of Suez to Dara Old Mines (Fig.1.2.)

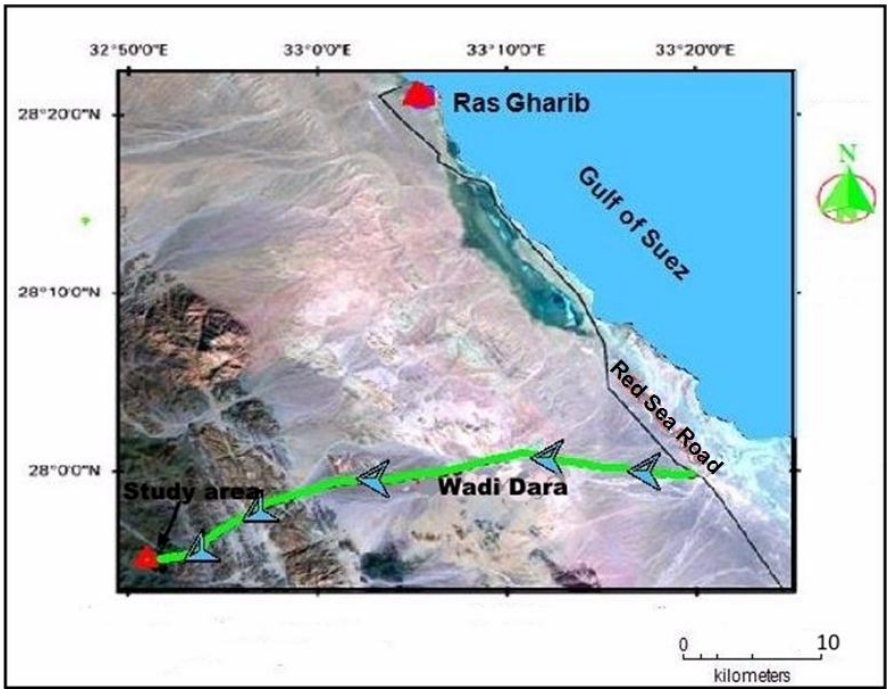

Fig.(1.2): Accessibility to the Study Area

1.4. Topography of the study area:

The study area is characterized by low to moderate topographic features and gently sloped mountain. The outcrops have highly weathered surfaces and covered by dumps of old mining. The Wadies are covered by placer deposits. The main wadies around study area such as Wadi Abu Hammad trending to NW-SE direction and Wadi Abu Maelem trending to NE-SW direction. In addition to several tributaries branched from the main wadies traverse the area.

The whole area consists of 550 stations by using total station instrument the elevation for every point is measured and by using (Oasis Montaj Program, version standard edition 6.4.2.,Geosoft Inc., 2007) the topographic map is created,(Fig.1.3).The study area consists of two parts, the first part is highly relief and located in the north west of study area which a maximum value is about 134m.The second part is low relief which located in the south east of the study area and the minimum value is 39 m.

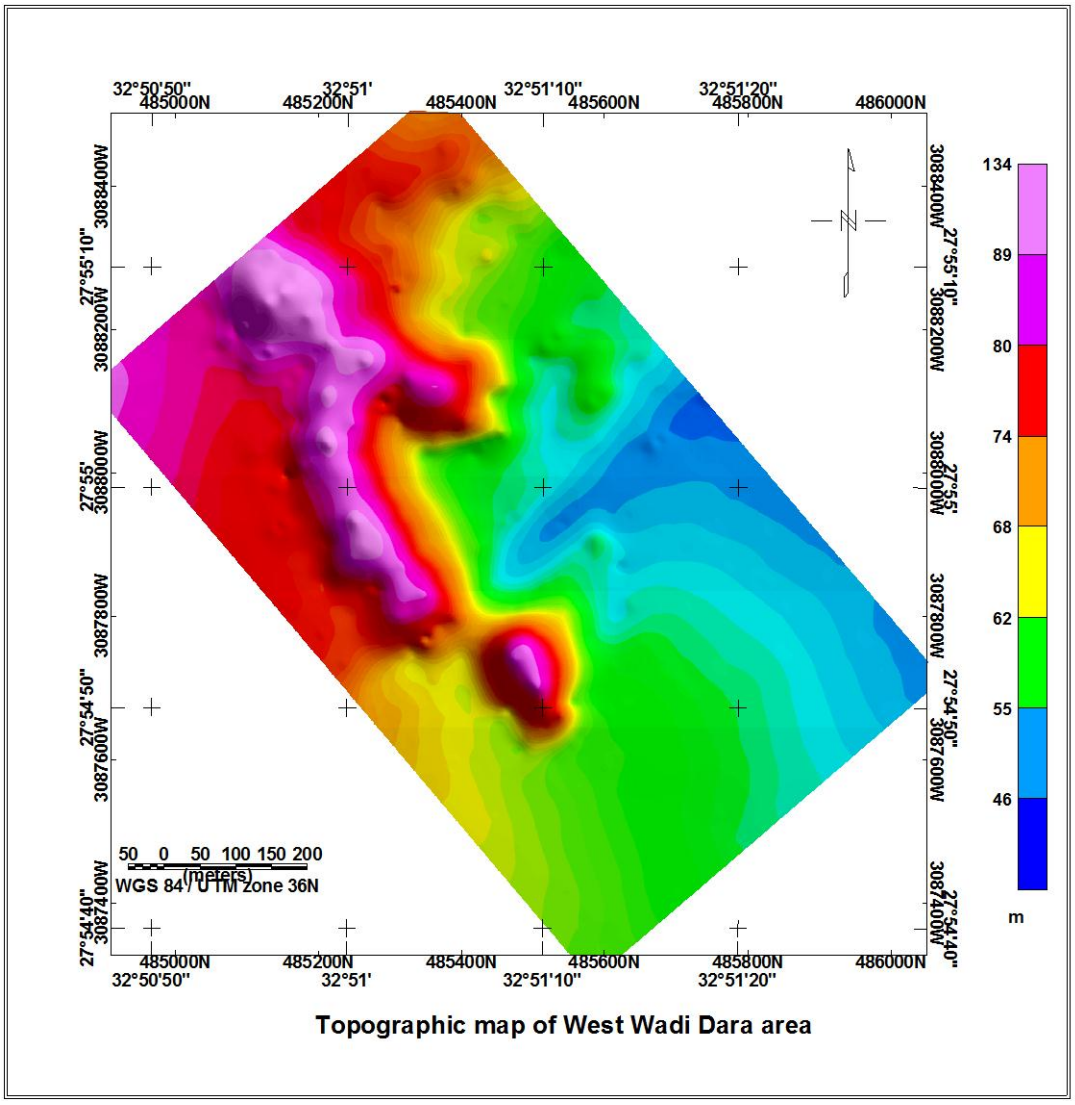

Fig. (1.3): Topographic Map of Old Mines Area, West Wadi Dara, North Eastern Desert, Egypt.