

**GROUND GEOPHYSICAL PROSPECTING ON ZOG EL-BOHAR
AREA, SOUTHWEST OF QUSEIR, EASTERN DESERT, EGYPT**

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**A thesis submitted in partial fulfillment of the requirements for the degree of
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NOTE

This thesis submitted to the department of geophysics, faculty of science, Ain-Shams University in partial fulfillment for the requirements of the Master degree of Science in Geophysics. The author did attend and success in ten main post- graduate courses in the following subject:

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

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ABSTRACT

Zog El-Bohar area is rich with considerable extensions of the black shales (oil shales) of the Dakhla Formation and the uranium-bearing phosphates of the Duwi Formation either on surface or subsurface. Their economical importance in many industries and radiometric applications, drew the attention of many workers to Zog El-Bohar area. The area is enclosed between latitudes $25^{\circ} 57' 49.29''$ N & $25^{\circ} 58' 27.91''$ N and longitudes $34^{\circ} 17' 25.92''$ E & $34^{\circ} 18' 11.31''$ E.

The surface geology of the area is relatively simple, characterizing by the presence of metagabbro, younger granites, Dakhla shales, Duwi Formation, Tarawan Formation and Quaternary deposits. Ground geophysical surveys are conducted in the purpose of identifying and outlining any radioactive anomalous zones, establishing the structural framework of the area and its relation with any expected radioactive occurrences as well as delineating the subsurface configuration of the Dakhla Formation (black shale). The surveys involved ground gamma-ray spectrometry, ground magnetic and geoelectric resistivity methods.

The spectrometric measurements recorded 52.6 Ur for Total Count (T.C.), 51 ppm equivalent Uranium (eU), 14 ppm equivalent Thorium (eTh) and 4.2 % for Potassium (K%). The high radiometric levels are mainly attributed to the phosphates of the Duwi Formation and more or less to the younger granites. The data were analyzed and processed using effective analysis techniques such as factor analysis, ternary composite imaging and statistical treatments. The factor analysis made it possible to recognize five interpreted litho-radiometric units which are highly correlated with the surface

geologic units of the area. The spectrometric data of these units were statistically treated on the basis of exceeding two and three standard deviation levels above the mean. Accordingly, two zones of uranium occurrences in the area could be distinguished as related to the phosphates of the Duwi Formation.

The ground total magnetic intensity data are reduced to the North magnetic Pole and hence the RTP map is subjected to the regional-residual separation process which indicated that, the shallow magnetic sources are at depth 92m, while that of deeper at 148m. The RTP data also, analyzed and processed with some advanced techniques involving horizontal gradient, 3-D Euler Deconvolution and the source parameter index (SPI). The most conspicuous feature that observed in the magnetic maps is the NNW to NW-trending low magnetic zone of a main basin (trough or syncline) which is dissected by faults to form local sub-basins. It is bounded with three high magnetic anomalous zones in the West, northeast and southeast directions. These anomalies may represent different magnetic sources as buried igneous bodies of basic composition that may be intruded to cut the pre-existing rocks.

The regional magnetic component map which generated at 148m depth as deep interface prove that the sedimentary succession filling the interpreted syncline is thicker than 148m and affected with NNW to NW and NEE major faults. Euler solutions and source parameter index (SPI) methods provided depths to the near-surface structures ranging from 30 to 90m, while, depths from 90m to more than 150m characterize the deep-seated structures. The magnetic data have been interpreted from the tectonic point of view to establish the trends of the structural elements affecting the area. These elements

are observed to be oriented mostly in NNW, NW, N-S and NNE directions as predominant trends and WNW and ENE as secondary trends.

The geoelectric study included 1-D data with Schlumberger array and 2-D data with Wenner array. The geoelectrical resistivity measurements were analyzed and processed with Zohdy (1989), IPI2win (2002) and Res2dinv (2001) software packages. According to the litho-stratigraphic column of thy study area, we can conclude that, there are five to six geoelectrical units equivalent to Quaternary sediments, Tarawan Formation, Dakhla shales, Duwi Formation, calcareous shales and Quseir variegated shales. The Dakhla is characterized by very low resistivity values comparable with the other rock units in the area since it has $2.5\Omega\text{-m}$ as average value. The layer attains 61.9m as average thickness which decreases slightly towards west and south directions to be 55 and 43.3m.

It is noticed that, thickness of Tarawan Formation, Dakhla shale and Duwi Formation increase towards north and northeast portions of the area, while that of calcareous shale and Quseir variegated shale increase due southwest. The area under consideration is affected by several faults in different directions and depths, this is clear from magnetic and electrical techniques.

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