

Electromagnetic Studies on The Qarun Protected Area, Fayoum-Province, Egypt

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SUMMARY

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The main object of our study are using suitable and fast tools of the Geoscience to evaluate the environmental impacts on the surrounding **Qarun Protected Area (QPA)** and natural resources. To achievement this target, Nuclear Magnetic Resonance (**NMR**) and Audio Magnetotelluric (**AMT**) were carried out on the **suggested area** for the first time in Egypt. In addition, land magnetic profile was conducted using GEM magnetometer (**Overhauser-19, Canada**). The daily variation of magnetic field is corrected using Misallat Magnetic observatory that is located at Kom Oshem village beside the Qarun Lake (about **25 km**). The results of NMR and AMT are conformed the depths of water table between 10 meters near Qarun Lake and 120 near Qatrani mountain.

Keywords: Nuclear Magnetic Resonance (**NMR**), Audio Magnetotelluric (**AMT**), Qarun Protected Area (**QPA**)

INTRODUCTION

Qaroun Protected Area (**QPA**) is established by the Egyptian national network of Protected Areas, which as on March 2007, as the Nature Conservation Sector of the Egyptian Environmental Affairs Agency (**EEAA**). It contains several features and areas of high value. The landscape is varied, attractive and includes some geological formations hosting fossil deposits of major importance site in the whole African continent in terms of fossil richness. The cultural heritage is also remarkable, with several archaeological sites of primary importance. A prominent feature of the area are the Eocene sediments of **Qasr el Sagha** and **Gebel Qatrani**, which represent the most complete record of Palaeogene mammals for all Africa, the fossil deposits of Qatrani, fossilized forest, ancient basalt quarries and other outstanding features. (Egyptian Environmental Affairs Agency, 2007).

Methods

We apply the NUMIS magnetic resonance which is the first time in Egypt, for exploration of ground water depth, its contents, porosity and permeability. Beside that, the high frequency magnetotelluric method to investigate the shallow subsurface structure of the area surrounded the Qarun Lake. Finally, the magnetic profile survey is conducted beside the magnetic resonance and magnetotelluric profiles figure (1).

The principle of Numis instument is a pulse of current at a given frequency is transmitted into a loop. The signal produced in return by the H protons (water molecules) is measured within the same loop

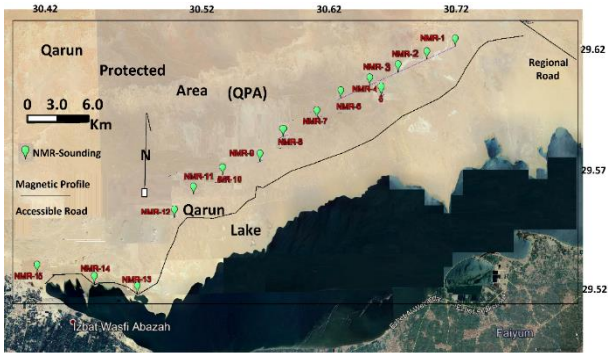


Figure 1: Location map showing NMR and AMT stations and magnetic profile (Google Earth).

Results

The magnetic profile was conducted every 25 m on the selected area and crossing the MT and MRS stations using GEM magnetometer (Overhauser-19, Canada), in order to see the shallow structures. The daily variation of magnetic field is corrected using Misallat Magnetic observatory that is located at Kom Oshem village beside the Qarun Lake (about 25 km).

The result of NUMIS magnetic resonance of stations 8, 9, 10 and 11 are showing in Figure (2). Also, the 1D-MT inversion of high frequency magnetotelluric are shown Figure (3).

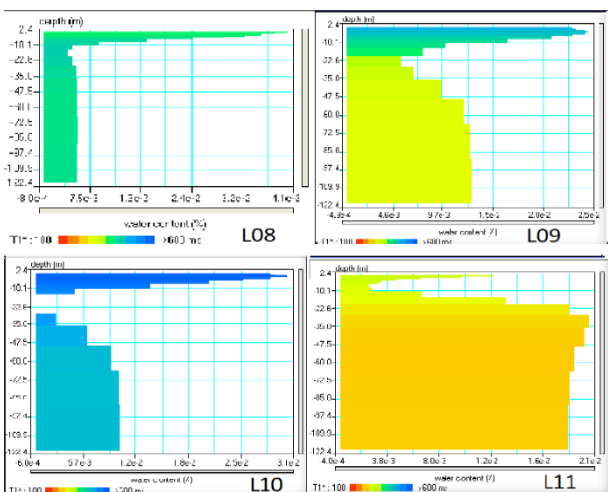


Figure 2: showing the results of Magnetic resonance (MRS)

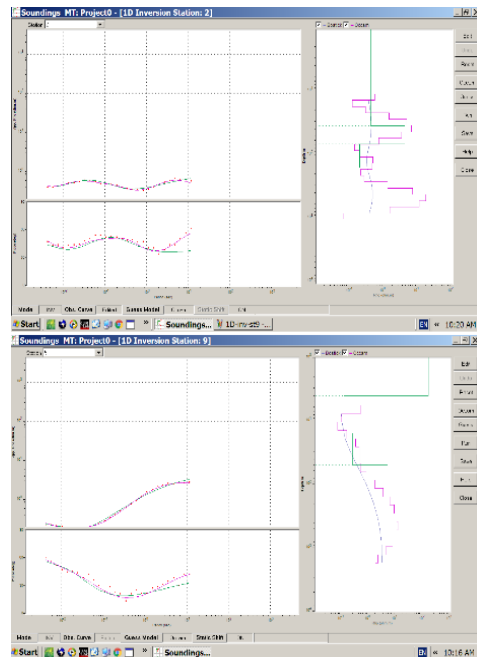


Figure (3): The results of 1D inversion of AMT.

Conclusion

The magnetic resonance method (MRS) able to investigate the ground water aquifer with easy way and measurements.-Also, evaluate the depth to water table, porosity (water contents) and permeability of the layers - Correlated with the MT results which are good agreement.

*Aquifer water-model interpretation is required to integrate with the geological and remote sensing data.