

## Project Summary

Egypt SEG Field Camp 2022 lasted for thirteen days from September 3<sup>rd</sup> to September 15<sup>th</sup> on which students were trained to use different geophysical methods such as the magnetic method, NMR, ERT and seismic method. The camp had significant diversity as it hosted 30 students from 14 universities in Egypt, Romania, Mexico, Somalia and Saudi Arabia, in addition to having equality of both genders.

## Significance

The Egyptian government seeks to provide other sources of freshwater as the gap between the limited water resources and the escalating demand for water has been rapidly increasing in Egypt since 1990, which makes water scarcity a major danger facing the country.

## Study Area

The study was conducted in Wadi El-Rayan which is located between Abu Gharadig and Beni Suef basins, approximately 115 kilometers southeast of Cairo. The sedimentary sequence of the area ranges in age from Lower Cretaceous to Middle Eocene. The coordinates of the field are 29.2°N and 30.4°E.



Fig: 1

## Sessions

- The field camp was divided into two periods. The pre-camp period was done online, consisted of technical lectures that covered the topics of magnetic method, NMR, VES and ERT, in addition to non-technical sessions about scholarships, communication, job-hunting and labor market skills.



Fig: 2



Fig: 3



Fig: 4

- At the beginning of the camp, several lectures were given, including personal branding and presentation skills.

## Camp Program

- The work of acquisition, processing and interpretation was done over the course of three days by five teams that switched methods each day.
- After field work, students were given one day of integration in order to finalize the office work on the acquired data, and their presentations.
- A field trip day was taken to Wadi Al-Hitan where students enjoyed the geology of the area, visited the Fossils & Climate Change Museum, and camped at Qatrani Camp for one night.
- At the end of the camp, the five teams presented their final work at Kuwait Energy Egypt where one team was chosen as the winning team.



Fig: 10



Fig: 9



Fig: 8



Fig: 5



Fig: 6



Fig: 7

## Geophysical Investigation

#In the magnetic method, the survey consisted of four profile lines, shown in (Figure 11), that covered the entire area of the lake. In this survey, the scalar Overhauser magnetometer GSM-19 was used. The Geosoft Oasis-Montaj software was used for the magnetic data to make the RTP correction after the base station and IGRF corrections. In (Figure 12) is a 2D model for profile p1-p1' which was 34 kilometers long and consisted of 69 stations with an interval of 500 meters.

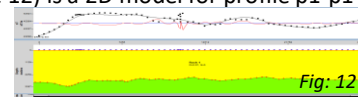


Fig: 12

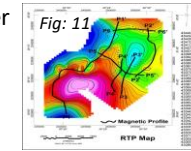


Fig: 11

#In the NMR method, four surveys were conducted over an area of 10,000 meters squared around the upper lake. StarataView was used for NMR data to also remove the outliers and smoothen the curve. (Figure 13) shows a profile of the acquired data of NMR, where the amplitude of the curve indicates a high number of protons and thus a high amount of water, and the intensity of the curve in this site shows a fairly shallow subsurface water. The shallowness of the water differed from one site to another.

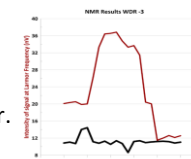


Fig: 13

#In the ERT method, the dipole-dipole array was used in three profiles, whereas the Schlumberger array was used in one other profile. RES2NDV was used for ERT data to remove the outliers and produce the inverted model. (Figure 14) shows the result of one of the dipole-dipole profiles where 32 electrodes were used with an interval of 5 meters, and 351 quadrupoles. This profile shows a wide range of resistivity with a maximum value of 313 ohm-meter which indicates the existence of massive limestone.

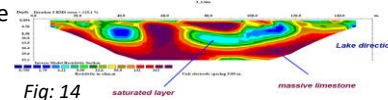


Fig: 14

#In seismic method, the survey was done in two sites west and north of the upper lake. The array configuration consisted of 48 geophones with an interval of 1 meter. The configuration was shifted seven times, as shown in (Figure 15), to obtain the average dispersion across the area. Geopsy was used for seismic data to produce a model with the lowest misfit. After the inversion of the acquired data, the boundaries between the layers were clearly shown. (Figure 16) shows the result of the survey done in the western area of the lake where there's a thick layer of soil overlying a deep limestone layer. In the northern area, however, the layer of soil was thinner as the limestone was closer to the surface.

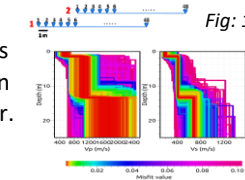


Fig: 16

## Results

→ The basement rocks in the area are approximately 2.8 kilometers deep, above which there is a limestone layer that varies in thickness from one site to another, and plays a role at transmitting the water to or from Wadi El-Rayan lake through its fractures. Atop the limestone is a layer of friable soil saturated with water and is 13 meters deep. The saturation and presence of water can extend to as much as 23 meters maximum at some locations throughout the area.

## Conclusion

- The area of Wadi El-Rayan Lake has great amounts of shallow water all around and beneath it.
- Further studies need to be done for the search of water sources. One recommended method is using isotope analysis.
- The students improved a variety of their soft skills which were topped by teamwork that was consistent and incomparable throughout the camp.
- The gap between the academic studies and practical work in the field was successfully decreased for all the teams.

## Acknowledgment



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