



# Hydrogeophysical and structural investigation using VES and TDEM data: A case study at El-Nubariya–Wadi El-Natron area, west Nile Delta, Egypt



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**Abstract** The geoelectric survey includes 93 Vertical Electric Soundings (VES) and 26 TEM stations were conducted to delineate the subsurface structures and hydrogeological regime of El-Nubariya–Wadi El-Natron area. The VESes AB/2 was varying from 1 up to 700 m in successive steps, while TEM stations were measured using coincident loop of 50 m side length.

The interpretation of the geoelectrical data shows that the depth to the main aquifer ranges from 6 m at the northern part near the Nubariya city to about 90 m at the southern parts where it increases to the south and southeast directions. Generally the aquifer system in the area can be divided into Pleistocene and Pliocene aquifers. The Pleistocene aquifer is the shallower aquifer in the area and it consists almost of gravelly to clayey sand deposits. The Pliocene aquifer is the main aquifer where it is composed of sand to gravelly sand deposits.

Depending on the results of the geoelectric prospecting represented by the true resistivity map, we can infer the quality of the groundwater. A brackish groundwater can be found at the northern and northeastern parts of the study area at shallow depths whereas relatively fresh water can be detected at the southern and southeastern parts around Wadi El Natrun city at deep depths.

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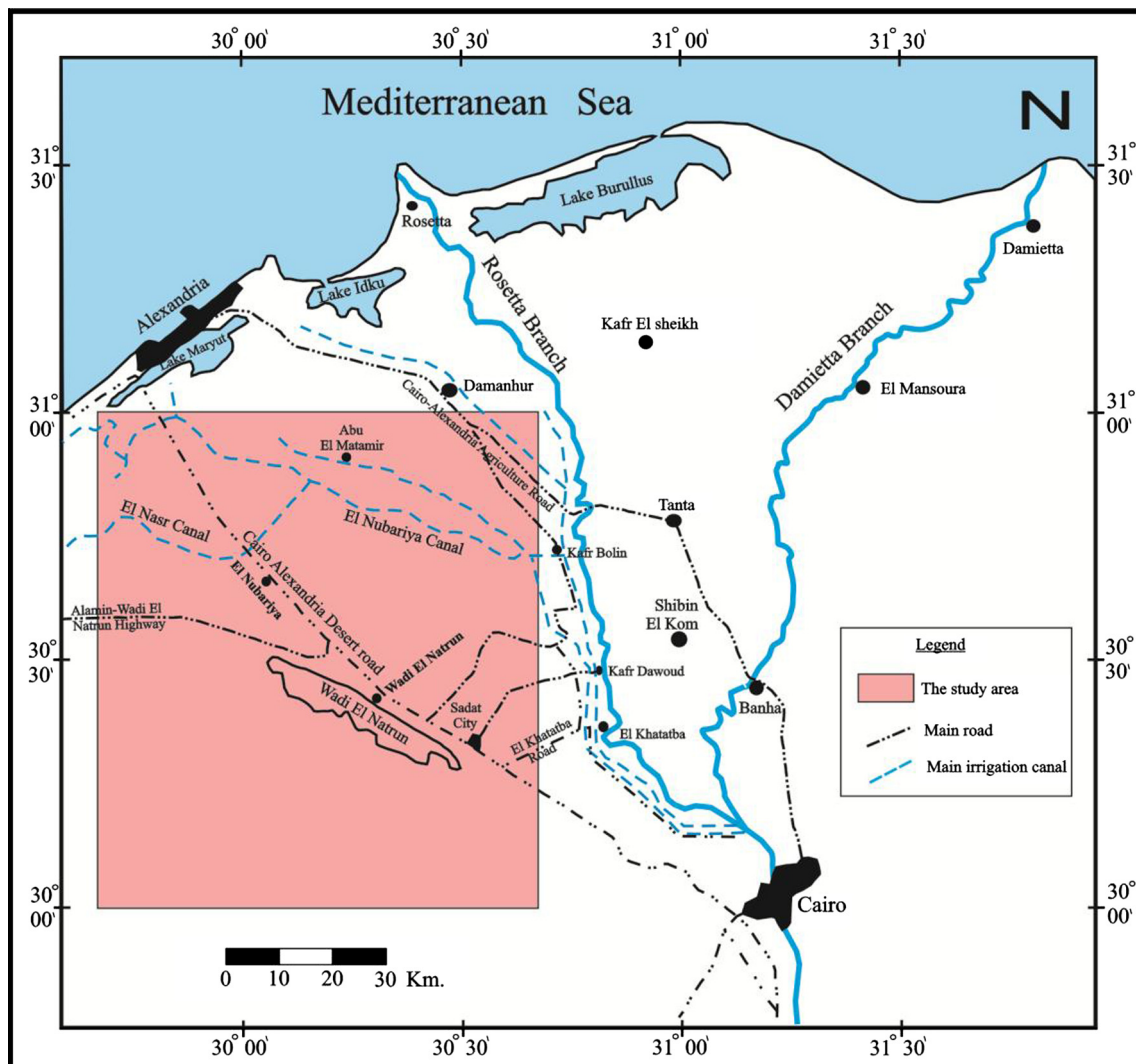
The area under consideration is affected by a group of normal faults that divided the investigated area into five main divisions, northern, eastern, western, southern and central divisions. The inferred faults from the geoelectric sections are traced and collected to construct a structure map. It is worth to mention that Wadi El Natrun and its lakes are structurally controlled by faulting systems trending NW direction.

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**1. Introduction**

Electrical resistivity method is, generally, considered to be the most promising and most suitable method for ground water prospecting. This is based on the concept of determination of the subsurface, which can yield useful information on the structure, composition and content of buried formation (Keller, 1967).

A great attention is paid by different Egyptian Authorities for the establishment of the new settlements and land reclamation projects to overcome the over population crisis and to construct new agricultural areas. In this respect, priorities are given to west Nile Delta area, which is considered as a promising region due to its distinct location, mild weather, easy accessibility and the availability of water supplies. Accordingly, new desert settlements are established e.g. South El Tahrir, El



**Figure 1** Location map for the study area and its surroundings.

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