



Hydrochemical evaluation of the groundwater resources in the area east of Minia District, Egypt

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The area under study is located between latitudes $30^{\circ} 45'$ and $30^{\circ} 55'$, and longitudes $27^{\circ} 40'$ and $28^{\circ} 35'$. It lies to the east of the River Nile partially in the Nile Valley and above the Eocene plateau covering about 430 Km². The main objective of this study is to evaluate the groundwater of the Pleistocene and fractured Eocene limestone aquifers in the area. The studied water samples were collected from wells tapping these aquifers (drilled at depths range between less than 10 m to more than 80 m) and distributed over the whole area. Regionally, the groundwater flows toward the north and west directions. The recharge of these aquifers takes place from the Nile River and the flash floods as well as the direct downward infiltration of the excess irrigation water. The Hydrochemical aspects were evaluated based on the chemical analysis of 22 water samples of Pleistocene aquifer and 12 water samples of fractured Eocene limestone aquifer, besides 3 surface water samples, (two of the Nile River and one irrigation canal). The TDS values of the groundwater of Pleistocene aquifer vary between 352 and 1664 ppm, while in those of fractured Eocene limestone aquifer vary between 499 and 8768 ppm. There is a general decrease in the water salinity of this aquifer from the east to westward. The dominant chemical water types of the Pleistocene aquifer are Ca(HCO₃), Mg(HCO₃) and NaHCO₃, while in the Eocene one, the dominant chemical water type is NaCl. The hypothetical salt combinations show that there is a hydraulic connection between the Nile water and the groundwater of both aquifers. The hydrochemical classification indicates that the water of the Pleistocene and Eocene aquifers reflect both the meteoric and marine origin. Most of the groundwater of the Pleistocene aquifer is suitable for irrigation purposes, while the groundwater of Eocene aquifer is almost not suitable for irrigation under normal conditions.