A hydrogeophysical study to estimate water seepage from northwestern Lake Nasser, Egypt

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Abstract

Estimating the water seepage from Lake Nasser, southern Egypt, into the adjacent Nubian sandstone aquifer is one of the main factors influencing the water balance of the lake. Up till now, there has been no information about seepage values, particularly in the northwestern part of the lake, due to a complete absence of boreholes. The present study is an approach using the time domain electromagnetic (TDEM) technique to estimate the hydraulic parameters of the shallow Nubian sandstone aquifer which are essential in water seepage calculations. The average porosity of the Nubian sandstone aquifer is calculated using bulk resistivities deduced from a TDEM model by applying the Archie formula. As calculated porosity values are consistent with laboratory measurements, accordingly the void ratio is estimated from the calculated porosity. The calculated void ratio in combination with the grain size diameter of the shallow part of the Nubian sandstone is used to estimate hydraulic conductivity. Then Darcy's low is applied to calculate the seepage value of the lake water in the adjacent Nubian sandstone aquifer. The main result of the current study shows that the anticipated water seepage value is 2.6×106 m3 yr–1. This value seems reasonable in comparison with the total seepage value inferred from isotope studies around Lake Nasser.

Keywords: hydrogeophysics, time domain electromagnetic, water seepage, Lake Nasser, Egypt