

## Abstract

Surface-subsurface water interaction plays an important role in controlling groundwater chemistry, understanding this process is the basis for sustainable development. This study aims to investigate the surface water recharge from Lake Nasser into the groundwater of the Nubian sandstone aquifer in Toshka area. To achieve that, forty nine water samples were collected and chemically analyzed. The geochemical modeling code NETPATHXL, statistical analysis and distribution maps of saturation indices for different minerals are carefully studied.

Results indicate that Lake Nasser is one of the main potential recharge sources to the Nubian sandstone aquifer and the distance to which the seepage process is ranging from 50 to 70 km. The saturation indices of calcite, dolomite, gypsum, anhydrite and silica minerals show negative values, decrease in the same directions of water flow, indicating sub-saturation and high potential for dissolution of such minerals. This can be referred to dilution caused by mixing of leaked surface- water from Lake Nasser with the groundwater in the Nubian sandstone aquifer. The contribution of recent recharge varies largely from 1% to 93% with an average of 48%, the mixing ratio is quite high and confirms the recharge from surface water of Lake Nasser. SPSS program were used to estimate factor analysis and cluster analysis. The result of factor analysis showed two factors ( $F_1$  and  $F_2$ ).  $F_1$  factor refers to leaching and dissolution processes.  $F_2$  is an indicator of the hydrochemical effect of leakage from lake Nasser to groundwater.

The scores of these factors were spatially distributed which showed that, the high values of  $F_1$  are found in the middle part of Toshka area. On the other hand  $F_2$  implies that, the high values of  $F_2$  are found at the eastern part of the study area, near to Lake Nasser.

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أهدى هذا الجهد المتواضع إلى روح الزكى النقي خير الأنام و  
مسك الختام سيدنا محمد عليه أفضل الصلاة و أتم السلام – الذى  
أرسله ربه برسالة العلم فكان أول ما أنزل عليه قوله-عز و جل- "اقرأ  
باسم ربك الذى خلق" و أرسله كذلك بتكريم العلماء فأنزل عليه "قل  
هل يستوي الذين يعلمون و الذين لا يعلمون" و قوله "يرفع الله الذين  
آمنوا منكم و الذين أوتوا العلم درجات" و قوله "إنما يخشى الله من  
عباده العلماء" و يقول صلى الله عليه و سلم عن نفسه (إنما بعثت  
معلما) فصلاة و سلاما على هذا النبي العظيم و على أهله و صحبه و  
من تبعهم بإحسان إلى يوم الدين.

المؤلف