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Hydrogeochemical modeling and Evaluation of Groundwater Quality in the Western Bank of the River Nile, Egypt

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The present work used major and trace element chemistry to assess the hydrogeochemical characteristics and groundwater quality for drinking and irrigation uses in the western bank of the River Nile, West El-Minia District. To achieve this purpose 88 groundwater samples were collected and completely chemical analyzed. Statistical analysis and hydrogeochemical modeling were applied to the collected data. The highest linear correlation is shown between total dissolved solids and electric conductivity, between carbonate substances, between Na^{+} and K^{+} and Ca^{2+} and Mg^{2+}, all macro-components and chlorides as well as between boron with chrome, cobalt, and lead. Hydrogeochemical modeling using PHREEQC was used to understand hydrogeochemical stability and processes taking place in the saturated part of the aquifer. Three data sets were selected two of them represented the data set with the highest and the lowest concentrations of ions, the third data set represented the averages of parameters. In case of maximum values sample, and average sample the same mineral phases precipitated from the solution. The results differentiate only saturation indices SI, which give information how far the sample is from equilibrium. The hydrogeochemical modeling has proved, that in the max sample cerussite is in balance (SI = 0), while in the average data sample the solution is unsaturated against cerussite (SI = -0.98). All sampled waters were classified as waters of Ca-HCO_3 type and calcite will precipitate in all collected water samples. Concerning trace elements, 49 % of studied water samples are not suitable for drinking and irrigation purposes. Depends on to boron concentration, SAR, and permeability index, all the collected samples are suitable for irrigation.