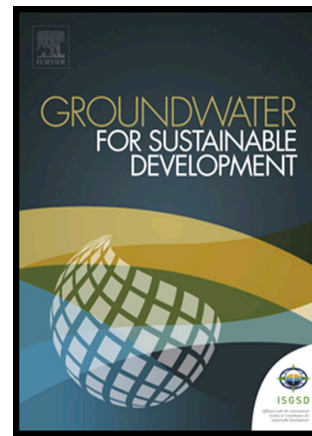


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Hydrochemical processes determining the groundwater quality for irrigation use in an arid environment: The case of Liwa Aquifer, Abu Dhabi, United Arab Emirates

Jibran Iqbal^{a*}, Yousef Nazzal^a, Fares Howari^a, Cijo Xavier^a, Ahmad Yousef^b

^aCollege of Natural and Health Sciences, Zayed University, PO Box 144534, Abu Dhabi, United Arab Emirates

^bIndependent Geospatial Researcher, Dubai, United Arab Emirates

Jibran.iqbal@zu.ac.ae

Yousef.Nazzal@zu.ac.ae

Fares.Howari@zu.ac.ae

Cijo.Xavier@zu.ac.ae

ahmad.yousef@hotmail.com

*Correspondence: Tel.: +971-55-9188346

Abstract

Evaluation of groundwater quality is very important in arid regions like United Arab Emirates where high evaporation rates and absence of present-day recharge coupled with increasing groundwater extraction may limit its use for irrigation purposes. The Liwa aquifer in Abu Dhabi Emirate is known for its intensive agriculture activities which depend on groundwater exploitation. The objective of the study was to determine the hydrochemical processes governing the groundwater chemistry, evaluation of groundwater quality and suitability for irrigation use. In the present study, 41 groundwater samples were collected from Liwa area in Abu Dhabi and analyzed for various physiochemical parameters such as pH, total dissolved solids (TDS), electrical conductivity (EC), Na⁺, K⁺, Ca²⁺, Mg²⁺, CO₃⁻, HCO₃⁻, Cl⁻, SO₄²⁻, NO₃⁻ and heavy metals. Electrical conductivity varies between 328 and 3003 uS/cm with an average value of 1478.5 uS/cm. Results show that changes in the groundwater chemistry is mainly controlled by rock weathering, to some extent evaporation and agricultural activities. The sodium ion was the main cation with an average value of 2923.2 mg/L, while the chloride ion was the dominant anion with an average value of 5670.8 mg/L. The water in the study area is mostly saline due to the dominance of these two ions. According to piper diagram, the main groundwater type in the study area was Na-Cl-SO₄ type. The suitability for agriculture use was assessed using sodium absorption ratio (SAR), sodium percentage (Na%), residual sodium concentration (RSC), Kelley's ratio, and magnesium hazard. Results showed that the groundwater quality in the study area is not suitable for irrigation.

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