

Identification of Seawater Intrusion in the Dibdibba Coastal Aquifer, South of Iraq Using Chemical Indicators and Multivariate Analyses

Lamees S. Al-Qurnawy¹, Inass A. Almallah² and Aymen Alrubaye³

^{1,3}Department of Sedimentology, Marine Science Center, University of Basrah, Basrah, Iraq.

²Department of Geology, College of Science, University of Basrah, Basrah, Iraq.

¹E-mail: lamees.abdulhussein@uobasrah.edu.iq

Abstract. Seawater intrusion into the groundwater is a major environmental disaster which affects the environment as well as community. This research aims to analyze the seawater intrusion in the Dibdibba coastal aquifer. In this study, researchers used statistical techniques to examine the impact of seawater intrusion in the Dibddiba coastal aquifer in southern Iraq. They collected 15 groundwater samples from pumping wells during wet and dry periods and analyzed those using multivariate statistical analyses and ionic ratios based on the GIS technique. The results showed that there was a strong linear correlation between total dissolved solids (TDS) and several other ions, including Ca^{2+} , Mg^{2+} , Na^+ , Cl^- , SO_4^{2-} , and NO_3^- . The principle component analysis revealed two factor loadings, with the first accounting for a significant portion of the total variance and showing a high loading for TDS, Na^+ , Cl^- , SO_4^{2-} , Mg^{2+} , Ca^{2+} , and NO_3^- . The second factor had a high loading for K^+ . The seawater influence was detected in 33.33 percent of the low zone groundwater, 26.66 percent of the moderate zone groundwater, and 40 percent of the high zone groundwater that was studied. Eighty and sixty-seven percent of the groundwater samples, respectively, belonged to the seawater field as Na-Cl type, as shown by Chadha's graphic, demonstrating the effect of seawater intrusion. Also, during the wet time, 20% of the samples belonged to the reverse ion exchange water field as Ca-Mg-Cl type, but during the dry period, 33.3% did. This is further evidence of the impact of seawater intrusion.

Keywords. Seawater intrusion, Aquifer, Multivariate analyses, Matrix, Ionic ratios, Ghadha.