

Hydrogeochemical investigations and groundwater quality assessment of Mashhad plain, the Northeast of Iran

J. HUSSAINZADEH^{1*}, A. MOHAMMADOST², R. FAYAZI³,
M. SHEKARI⁴

1[1The Student Ferdowsi University of Mashhad, Iran

(*correspondence: javady5000@gmail.com)]

2[2The Student Ferdowsi University of Mashhad, Iran (alimahdi600@gmail.com)]

3[3The Student Ferdowsi University of Mashhad, Iran (rezafayazi2013@gmail.com)]

4[4The Student Ferdowsi University of Mashhad, Iran (mohsenshekari74@gmail.com)]

Hydrogeochemical investigations of groundwater in Mashhad plain are allotted to assess the water quality for drinking and irrigation functions. During this study, 98 groundwater samples were collected and analyzed for physicochemical parameters and major ion concentrations. The abundance of major cations and anions was in the following order: $\text{Na}^+ > \text{Mg}^{2+} > \text{Ca}^{2+} > \text{K}^+$, and $\text{Cl}^- > \text{SO}_4^{2-} > \text{HCO}_3^- > \text{CO}_3^{2-}$. As a result, alkaline component (Na^+) exceeds alkaline-earth metal elements (Mg^{2+} and Ca^{2+}), and strong acids (Cl^-) dominate weak acids (HCO_3^- and CO_3^{2-}) in the majority of the groundwater samples. Statistical analyses, as well as Spearman correlation coefficients and factor analysis, display a good correlation between physicochemical parameters (EC, TDS, and TH) and Na^+ , Mg^{2+} , Ca^{2+} , Cl^- and SO_4^{2-} . The results display that rock-weathering interactions and ion-exchange processes play a vital role in controlling groundwater chemistry. SI values (Saturation Index) also signify that water chemistry is significantly affected by carbonate minerals like calcite, aragonite, and dolomite. According to Piper diagram, mixed CaMgCl, CaHCO₃ and NaCl are the pre-dominant hydrogeochemical facies in the plain, respectively. USSL (US Salinity Laboratory) and Wilcox diagrams beside porosity index values reveal that the majority of the groundwater samples are appropriate for irrigation purposes.

Keywords

Hydrogeochemistry, Major ions, Saturation Index, Drinking water quality, Mashhad plain