



Hydrochemical evolution mechanism of groundwater in the People's Victory Canal Irrigation District, China

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ABSTRACT

Under the influence of natural factors and human activities, groundwater dynamic field and hydrochemical field in the People's Victory Canal Irrigation District, a piedmont well irrigation district in the north Henan province, have changed significantly. In this paper, the statistical characteristics of major ions in the groundwater in the People's Victory Canal Irrigation District were analyzed based on the sampled data in wet season and dry season, and then the main hydrochemical processes in the runoff process of groundwater were discussed using different ion proportionality coefficient method. The results showed that Na^+ and HCO_3^- were the major cation and anion in the groundwater, respectively. The order of cations in concentration was $\text{Na}^+ > \text{Ca}^{2+} > \text{Mg}^{2+} > \text{K}^+$, and the order of anions in average concentration was $\text{HCO}_3^- > \text{SO}_4^{2-} > \text{Cl}^-$. The rock weathering and dissolution mainly controlled the hydrochemical evolution of groundwater, as Na^+ , Ca^{2+} , Mg^{2+} , Cl^- , and SO_4^{2-} in the groundwater were mainly derived from the dissolution of carbonates and sulfates. In addition, they were also derived from the dissolution of aluminum silicate minerals (such as albite). Besides, the hydrochemical process was accompanied by cation-exchange adsorption. The cation exchange between Na^+ in the groundwater and Ca^{2+} and Mg^{2+} in soil occurred in most of the study area except G-01 area. The chemical constituents of groundwater were not only influenced by natural factors, but also by human activities. Especially in G-01, G-06, and G-08 areas, human pollution influenced the chemical constituents of groundwater obviously.

Keywords: People's Victory Canal Irrigation District; Hydrochemical characteristics; Ion proportionality coefficient; Hydrochemical evolution; Groundwater pollution

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