

Hydrogeochemical and isotopic characterization of saline groundwater in a shallow aquifer near a river

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Groundwater with Cl concentration up to 2,000 mg/L was found in a shallow alluvial aquifer near a lower reach of a large river (Nakdong River, South Korea). We investigated hydrogeochemical and isotopic characteristics of groundwater in this area to identify hydrogeologic and geochemical processes for formation of the saline groundwater. Cl and Br showed salinity of groundwater derived mainly from seawater. Concentrations of Na, K and Mg were slightly lower and concentration of Ca was higher compared to simple mixing of river water and seawater. Stable isotopes of water showed that groundwater from both upper and lower part of the aquifer near the river is not derived from nearby shallow groundwater. $^{87}\text{Sr}/^{86}\text{Sr}$ in groundwater from the upper part of the aquifer was nearly identical to nearby shallow groundwater, but significantly higher than that of seawater. In contrast, $^{87}\text{Sr}/^{86}\text{Sr}$ in saline groundwater was lower than that of seawater and approach to those of granite in the area. Carbon isotopic composition of dissolved inorganic carbon ($\delta^{13}\text{C}_{\text{DIC}}$) showed that carbon source is derived mainly from soil CO_2 . Dating of groundwater by CFCs showed groundwater is older than 50 years. This indicates that groundwater is effectively isolated from recent recharge though anaerobic microbial degradation may affect the dating results.