

Investigation of salinization processes in a confined aquifer system; Application of sulfur and chlorine stable isotopes

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A combination of sulfur and chlorine stable isotopes ($\delta^{34}\text{S}$ and $\delta^{37}\text{Cl}$) has been used to investigate salinization processes in a confined aquifer system in southwestern Nobi Plain (SWNP), central Japan. Deduced from the SO_4/Cl ratios and $\delta^{34}\text{S}$ values, a tongue of brackish confined groundwater ($\text{Cl}^- > 1000 \text{ mg/L}$), which extends from the shoreline of Ise Bay inland, mostly has two salinity sources; One is modern seawater, another is paleo seawater having no SO_4^{2-} due to sulfate reduction process. The Cl isotopic compositions are negatively correlated with paleo seawater Cl^- concentrations, while they are not correlated with either total Cl^- concentrations or $\delta^{34}\text{S}$ values. Furthermore, Cl^- concentrations from modern seawater are positively correlated with $\delta^{37}\text{Cl}$ values. In addition to these observations, diffusion model calculations suggest that paleo seawater Cl^- has diffused in argillaceous freshwater sediments whereas modern seawater Cl^- has not been affected by preferential diffusion of Cl isotopes because it has migrated by advection via both an unconfined aquifer and non-pumping wells.

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