

Stable isotope evidences for groundwater recharge and mixing in the Datong basin, Northern China

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Datong basin is an inland sedimentary basin evolved from a fossil lake, and groundwater is the primary water source of potable water and industry. However, elevated arsenic, fluoride and iodine concentrations are found in the groundwater from Datong basin, the spatial distribution of which have been widely reported by our previous studies. Stable isotopes including hydrogen, oxygen and strontium isotopes as natural tracers have been proven to be very useful tools to identify groundwater recharge and mixing processes. In this study, $\delta^2\text{H}$ and $\delta^{18}\text{O}$ were measured in 28 groundwater samples and 2 reservoir water samples with the ranges of $-51.4 \sim -90.2 \text{‰}$ and $-6.1 \sim -12.3 \text{‰}$, respectively. $\delta^2\text{H}$ and $\delta^{18}\text{O}$ compositions of reservoir are slightly higher than that of groundwater samples. Moreover, since the existence of different well construction, $\delta^2\text{H}$ and $\delta^{18}\text{O}$ compositions of groundwater samples show evidently stratification that isotopic compositions of single layer groundwater samples ($-74 \sim -90.2 \text{‰}$ and $-9.8 \sim -12.3 \text{‰}$) are lighter than that of mixing groundwater samples ($-51.4 \sim -76 \text{‰}$ and $-6.1 \sim -10.1 \text{‰}$). It suggests that some extra sources are contributed to the mixing groundwater, for instance the upstream reservoir water and/or irrigation water. Strontium isotope was measured in 26 groundwater samples and 2 reservoir water samples with the $^{87}\text{Sr}/^{86}\text{Sr}$ ranges from 0.7087217 to 0.7215510, the characteristics of which clearly shows the several groundwater flowpaths in the Datong basin.