

Geochemical diagnosis of groundwater flow system in the Ohno basin, Fukui prefecture

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Shallow groundwater system is developed in the city area of the northwestern Ohno basin, Fukui prefecture. This groundwater, termed as city-GW, has been used for daily lives and industries, but the recharge area and flow system of city-GW remain unclear. For the sustainable use of city-GW, we determined multiple components for the surface water and well water collected by elementary pupils as environmental education.

The oxygen and hydrogen isotope ratios of the city-GW decrease from -8.1‰ and -48‰ to -9.1‰ and -57‰ toward the west. The city-GW is divided by an interval of 0.1‰ in the $d^{18}\text{O}$ value and 0.8‰ in the $d^2\text{H}$ value. As the groundwater level decreases from south to west, it is likely that each isotope envelope corresponds to the flow channel. This view is consistent with the spatial distribution of several dissolved ions such as Ca^{2+} ; the high concentration of Ca^{2+} corresponds to the groundwater with a uniform $d^{18}\text{O}$ - $d^2\text{H}$ value ($-8.9 - -8.8\text{‰}$ and $-52 - -51.2\text{‰}$). It is likely that the city-GW is recharged mainly from the southern alluvial fan where agriculture is active. This is consistent with the high concentrations of As and Mo in southeastern city-GW, suggesting the contribution of fertilizer.

The western city-GW is enriched in NO_3 , indicating the source of N to be human activities such as sewerage. Several components (K, SO_4) in the western city-GW is further subdivided into the north and the south by Mt. Kameyama, which is composed of granite. This result suggests that the geochemical nature of aquifer sediments in the north are different from that in the south by this mountain. This view is compatible with the analysis for the fluctuation record of water level at 14 monitoring sites in the city-GW area. We consider that Mt. Kamayama plays a role as a barrier for the southerly flow of the city-GW. Thus, the water quality mapping is effective for elucidating the flow system of groundwater.

Keywords: groundwater, Ohno basin, flow channel, stable isotope