

## A study of water quality and groundwater recharge in Katakai River alluvial fan over the past 15 years based on isotopic composition and chemical concentration

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In the Katakai River alluvial fan located in Uozu City, Toyama Prefecture, groundwater is used extensively for tap water, agricultural and industrial purposes, etc. However, the quality of the groundwater has been, as it were, taken for granted, and monitored only partially and irregularly in the recent past. The aim of this study was to reanalyze the data from two previous studies in order to evaluate the groundwater quality in the area, based on the stable isotopes of hydrogen and oxygen and chemical composition.

Suzuki, who studied the groundwater from wells throughout the area and its relation to water from Katakai River, suggested that there are at least two layers of aquifers in the Katakai River alluvial fan –one shallower than 70 m from the ground surface and the other deeper than 80 m. By measuring tritium concentration, he also found that the residence time of groundwater is 10 to 20 years (Suzuki, 2002). Also in 2002, Uozu City conducted a groundwater research throughout the area, and has been conducting an annual monitoring of groundwater quality in the northern part of the river fan since 2004.

The  $\delta^{18}\text{O}$  value of the groundwater in the Katakai River fan in 2002 was similar to the  $\delta^{18}\text{O}$  value of the river water from the Katakai River along the coast. Furthermore, the contribution ratio of river water to groundwater was about 80 %. The similar isotopic composition of river water and groundwater, indicates that the Katakai River discharged to groundwater through the ancient river course without being affected by precipitation.

Both the hexa-diagram of unconfined groundwater described in Suzuki (2002) and that obtained in my own study in 2016 were the type of  $\text{Ca-HCO}_3$ . Therefore, it seems that water quality has not changed over these years. In addition, from the annual monitoring data of self-discharge quantity of confined groundwater in 2004-2016, it was found that the volume of water increased in summer and decreased in winter. The exploitation of groundwater for the snow melting on the roads may be causing the decrease of confined groundwater flux in winter. At one well with the depth of 100 m, a decrease was observed in the volume of confined water. Since this groundwater is the type of  $\text{Na} \cdot \text{Ca-Cl}$ , it may take a long time for water recharging from Katakai River. This seems to suggest the vulnerability of deep confined groundwater. Consequently, the reasonable utilization and conservation of deep groundwater should be considered for sustainable groundwater management in the future.

Keywords: ground water, Katakai River alluvial fan, Uoze city