

# Geochemical study of supply process of magmatic components to groundwater and thermal water in and around Iwate volcano, Japan

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Iwate volcano located in the NE Japan is composed of two stratovolcanoes, East Iwate and West Iwate. In and around Iwate volcano, shallow groundwater flow system and recharge area has been understood using the chemical and isotopic compositions of river and spring water (Kazahaya et al. 1998). In this study, based on the features of chemical and isotopic compositions of the shallow groundwater and the deep thermal water which collected from variety of depth, we discuss supply process of the magmatic components to the groundwater and thermal water in and around Iwate volcano in conjunction with the structure of volcanic body.

The previous study shows that a biggest spring called Oide spring located in east flank with a flow rate of 50000 tons/day was derived from the groundwater which recharged at the summit of Iwate volcano (Kazahaya et al. 1998). Oide spring and groundwater around this spring have relatively high  $\text{HCO}_3^-$  concentrations and high  $^3\text{He}/^4\text{He}$  ratio (2.2-4.0Ra), whereas the thermal water collected at a 810m-deep well located near Oide spring has low  $\delta\text{D}$  and  $\delta^{18}\text{O}$ , and low  $^3\text{He}/^4\text{He}$  ratio of 0.1Ra. This thermal water is collected from an aquifer in Tertiary sediment acting as hydrological basement in this area. Above results suggest that this thermal water has an older age and accumulates radiogenic  $^4\text{He}$ , and moreover, suggest that the large amount of magmatic components are supplied to the shallow groundwater, whereas the groundwater in the basement is less affected by the magmatic component because of isolation of the aquifer.

In contrast to the east flank, an active fault named Shizukuishi fault is placed in the southwest flank. The thermal waters along this fault are collected from bore holes with about 1000m depth and have high  $\text{Cl}^-$ ,  $\text{HCO}_3^-$  concentrations and high  $^3\text{He}/^4\text{He}$  ratio (2.5-3.0Ra). Additionally, the shallow groundwaters in this area also have high  $\text{HCO}_3^-$  concentrations and  $^3\text{He}/^4\text{He}$  ratio (1.7-5.3Ra). The recharge area of the shallow groundwater in this area is comparatively low altitude area of the south flank of this volcano, suggesting that the thermal water and groundwater around the fault have a contribution of the magmatic or mantle components via fault regardless of depth.

Based on the above results, the groundwater system and supply process of the magmatic components in and around Iwate volcano is summarized as follows. In the east flank area, a large shallow groundwater system is recharged at the summit area of East Iwate, and has been supplied with the magmatic components. A deeper groundwater aquifer is isolated to the supply system of magmatic components. In the southwest flank area, the magmatic components are likely supplied via fault to the deep thermal waters and the shallow groundwater. These results suggest that the difference of structure of volcanic body brings the difference of supply process of the magmatic component to surrounding groundwater systems.