Clarification of cause of temporal tracer variations in spring water, Kamikochi, Shinshu

*長幡 嘉健[1]、榊原 厚一[1]、鈴木 啓助[1]
*Yoshitake Nagahata[1], Koichi Sakakibara[1], Keisuke Suzuki[1]

1. 信州大学
1. Shinshu University

Understanding of groundwater discharge processes in mountain regions is important for the prevention of natural disasters such as flood and landslide. The temporal variation of environmental tracers can characterize the discharge process; hence, the long-term data of environmental tracers should be obtained to describe groundwater discharge processes in mountain regions. However, there are few researches using long-term tracer data on the high-mountain hydrology field due to difficulties of access and severe weather. Therefore, the objective of this study is to investigate the temporal change of environmental tracers and its cause in groundwater in Kamikochi, Shinshu, Japan. For this, field surveys were conducted once every 2 weeks throughout the year (from October 2018 to October 2019). Water samples (4 springs and 1 precipitation) were collected from 4 groundwater discharge points and 1 precipitation sampler location. Then, we measured basic water quality and analyzed dissolved inorganic ion concentrations and oxygen/hydrogen stable isotopic compositions of water.

Water temperature of 3 of 4 springs gradually decreases in autumn and winter seasons. And, that gradually increases in spring and summer seasons. In addition, water temperature of those springs rapidly increases shortly after heavy rainfall events. On the other hand, water temperature of the rest of springs does not change so much throughout the year. These results indicate the groundwater discharge processes of one spring are different from other springs even these discharge locations are close to each other. pH and EC of spring waters have no clear temporal tendencies throughout the year, although EC of some spring waters slightly decreases from May to August.

Water chemistry inferred that calcium-bicarbonate water type was dominant; hence, calcium and bicarbonate ions could be treated as effective tracers in this study. These two ions concentration slightly increases and decreases in winter and spring seasons, respectively. Considering snow conditions, the groundwater recharge process is limited in winter season due to snow-accumulation and that is enhanced in spring season due to snowmelt. This should be the main causes of water chemistry variation.

Stable isotopic compositions of oxygen and hydrogen in precipitation ranged from −21.7‰ to −6.8‰ and from −159.9‰ to −38.0‰, respectively. On the other hand, those of oxygen and hydrogen in spring water ranged from −14.5‰ to −8.5‰ and from −96.0‰ to −76.3‰, respectively. This suggests precipitation may affects some parts of spring water; however, groundwater is discharged as spring some moment after groundwater recharge by precipitation. Therefore, it is necessary to investigate groundwater age for more precise discussion regarding environmental tracer variations.

キーワード：上高地、湧水、溶存イオン、酸素・水素安定同位体比
Keywords: Kamikochi, spring, dissolved ion , oxygen/hydrogen stable isotopes

