

Altitude effect of water stable isotopic ratio of ravine water and its contribution to groundwater in alluvial plains - Comparison in east and west side catchments of Lake Biwa –

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The stable isotope ratio of hydrogen and oxygen in water is one of useful tracers for hydrological cycle and processes in the catchment scale as well as global. The typical characteristics are spatial or geographical distribution trend such as “altitude effect” or “inland effect”, which are lower in the higher altitude or more inland. Based on these trend, the groundwater recharge area had been estimated. However, the merger of these effects and additional effect such as the seasonal variation of isotopic ratio in precipitation or vapor causes various trend.

In this study, we examined to confirm the altitude effect of water stable isotope ratio and estimate recharge altitude to groundwater in alluvial plains, with comparing in the east and west side catchments of Lake Biwa.

Sampling of spring water in the Serikawa upstream area on the east side of Lake Biwa was conducted in July 2017, December 2017, August 2018. Sampling of ravine water in the Adogawa / Ukawa upstream area on the west side of Lake Biwa was conducted in August 2018. Water samples of spring in the head water and groundwater in the alluvial plain were collected at 11 and 2 sites in the east and at 13 and 2 in the west with measuring EC, pH and DO, respectively. The water stable isotopic ratios were analyzed by PICARO.

Stable isotopic ratios in groundwater were lower than surface water in both east and west. Altitude effects of spring water in the head water were recognizable. This means the surface water in the alluvial plain was mainly contributed from Lake Biwa, whereas groundwater was from the head water. The altitude effect of oxygen stable isotopic ratio was 0.15 - 0.13 ‰/ 100 m on the east side and 0.15 ‰/ 100 m on the west side (only in the upper stream of the Ado River). In addition, the δ value of isotopic ratio in the precipitation was 23‰ in the upper Adokawa in August 2018, 18 ‰ in Ugawa, and 20 ‰ in Serikawa. We also estimated groundwater recharge elevation and water contribution rate in the upstream region based on these.

Keywords: stable isotope, altitude effect, groundwater recharge