Observation of hydrogen and oxygen isotopes in the Kurobe River basin

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The purpose of this study is to clarify the medium-term, long-term, and seasonal change in hydrogen and oxygen isotope of river water and groundwater in the Kurobe River basin. We conducted monthly river water and groundwater observations as well as the analysis during three years period of May 2014 - April 2017.

The results demonstrated that hydrogen and oxygen isotope of groundwater in the Kurobe River basin was almost constant through the three years period. The river water showed a seasonal change of decreasing their hydrogen and oxygen isotope during May to July and increasing it during the winter. Whereas, the discharge boost between May to June and drop it during the winter season. Most of the precipitation in mountainous areas during the winter season is snowfall and it is stored as snow cover. Therefore, the river discharge rate decreases. Hydrogen and oxygen isotope values of river water decreasing when the snow melted into the river.

The relationship between hydrogen and oxygen isotope of river water and groundwater in the Kurobe River basin is δD=7.94d18δ^{18}O+19.37. The Meteoric water line in the Kurobe River basin is high in comparison with GMWL. According to Waseda and Nakai (1983), d-intercept varies with regional weather conditions. It was similar to the LMWL(δD=8δ^{18}O+20) of the Shogawa alluvial fan in Toyama prefecture. River water and groundwater in the Kurobe River basin are distributed along the meteoric water line. It is apparent that the origin of river water and groundwater in Kurobe River basin was derived from meteoric water. The oxygen isotope values of groundwater are into between -8 to -10 ‰and -10 to -14 ‰in the Kurobe River alluvial fan, and the recharge sources are considered to be different. The groundwater samples are classified into two types based on recharge sources. First, the oxygen isotope values of groundwater are classified as “-8 to -10 ‰” is equal to the average values of the oxygen isotope values of the rainwater sampled in the Kurobe River alluvial fan. It estimated that the rainwater in Kurobe River alluvial fan is the main recharge source because it is high in comparison with oxygen isotope values of river water. Second, the oxygen isotope values of groundwater are categorized as “-10 to -14 ‰” is equal to the average values of the oxygen isotope values of the river water located at the top part of Kurobe River alluvial fan. As a result, the main recharge source is obviously from the Kurobe River. It is considered that the groundwater is affected by rainwater because the oxygen isotope values increase as the distance from the Kurobe River. The hydrogen isotope values of groundwater are divided into -50 to -60 ‰and -70 to -80 ‰in the Kurobe River alluvial fan. Thus, the result of the hydrogen isotope of the groundwater is consistent with oxygen isotope.

Reference

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