Groundwater recharge in the Kurobe River Alluvial Fan and the nutrient dynamics using chemical compositions, oxygen and hydrogen isotopes: influence by land-use and climate changes over the past 30 years

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Kurobe River Alluvial Fan is the largest one in Japan and is located in the eastern Toyama Prefecture. This region has been known as rich in groundwater, and infiltration water from the Kurobe River plays an important role in the preservation of groundwater. However, it is reported that the groundwater level of the Kurobe River Alluvial Fan has continuously declined over the past 30 years. The decline in groundwater level will cause the change in groundwater quality. In order to sustain groundwater usage effectively, it is essential to grasp the groundwater quality changes and clarify the relationships between climate change, land-use, groundwater usage, and groundwater quality. For a better understanding of the effects of climate change and land-use change on the groundwater quality of the Kurobe River Alluvial Fan, this study focused on nutrient concentration in groundwater and river water and their dynamics and long-time changes were discussed.

Data and water samples of groundwater and river water were collected during the 4 seasons in 2018-2019 (in April, July, November, and December). The major ion components (Na^+, K^+, Ca^{2+}, Mg^{2+}, HCO_3^-, Cl^-, SO_4^{2-}), nutrients (NO_3, PO_4, SiO_2) and water isotopes $\delta^{18}O$ and δD (The analytical precisions were ±0.07‰ for δD and ±0.05‰ for $\delta^{18}O$) in the samples were measured. To evaluate the long-term changes, the previous data set in our research group from 1989,2003-2004, and 2011-2012 was also re-analyzed. The changes in land-use for the past 30 years were examined using Geographic Information System (GIS).

Our future work will investigate how the changes in the amount of nutrients in groundwater and river water influence the nutrient supply to the surface seawater, and affect the primary production in the coastal environment.

Keywords: groundwater, isotope, nutrients, climate change, land-use

