

Impact of climate change on groundwater quality and quantity for three decades : nutrient and carbon fluxes to the coastal area in Central Japan

SAKI KATAZAKAI¹, JING ZHANG²

¹Graduation School of Sci. and Eng., Univ. of Toyama, 3190 Gofuku, Toyama, 930-8555, Japan (d1872301@ems.u-toyama.ac.jp)

²Graduation School of Sci. and Eng., Univ. of Toyama, 3190 Gofuku, Toyama, 930-8555, Japan (Correspondence: jzhang@sci.u-toyama.ac.jp)

Submarine groundwater discharge (SGD) is one of the important pathway of water, nutrients and carbon from the land to ocean as well as riverine. In particular, submarine fresh groundwater discharge (SFGD) is linked with terrestrial groundwater, so it may be affected by climate change on the land and the change of land-use. The aim of this study is to clarify the current nutrients and carbon fluxes via river and SGD into the coastal area in Toyama, central Japan, analyzing chemical composition as well as hydrogen and oxygen stable isotopes.

The hydrogen and oxygen stable isotopes ratio of groundwater was lower than in the past, and the nutrient concentration was also lower. These results suggest that water originated from high elevations discharges more into shallow groundwater. It is assumed that this reflects the decrease in snowfall and the increase in rainfall in the mountainous area, as well as the declined reduced the area in forests and paddy field. In addition, pH values of the two monitored wells decreased, the increase in dissolved oxygen and the decrease in chloride and nitrate concentrations in the short period of 2005-2014. All these results are also considered to be related to the increase in rainfall. Moreover, we calculated nutrient and carbon fluxes of river and SGD comparing the data set of our results and those of past chemical analyses. The estimation of nutrient flux reduced by about 50%, while DIC and CO₂ (aq) fluxes increased 1.5 times and two times, respectively. Therefore, SGD is important not only as a nutrient source but also as a carbon source, and may continue to change due to climate change and human activities.