Understanding Freshwater Quality Problems in a Changing World
Proceedings of H04, IAHS-IAPSO-IASPEI Assembly, Gothenburg, Sweden, July 2013 (IAHS Publ. 361, 2013). 257-264

Combined use of stable isotope ratios to understand groundwater quality changes in Kumamoto area, southern Japan

TAKAHIRO HOSONO[1], TAKAHIRO TOKUNAGA[2], AKANE TSUSHIMA[1,3], MAKOTO KAGABU[2], HARUHIKO NAKATA[2] & JUN SHIMADA[2]

1 Priority Organization for Innovation and Excellence, Kumamoto University, 2-39-1 Kurokami, Kumamoto 860-8555, Japan
hosono@kumamoto-u.ac.jp

2 Graduate School of Science and Technology, Kumamoto University, 2-39-1 Kurokami, Kumamoto 860-8555, Japan

3 Present address*: Institute of Low Temperature Science, Hokkaido University, Kita-19, Nishi-8, Kita-ku, Sapporo 060-0819, Japan*

Abstract Combined use of several stable isotope ratios is increasingly recognized as an important approach for comprehensive understanding of water deterioration mechanisms. However, such trials have not often been seen and the importance of the application of these tracers has not been fully demonstrated. This paper presents a case study in Kumamoto groundwater, southern Japan, applying multiple isotope ratios ($\delta^{13}C_{DIC}$, $\delta^{15}N_{NO3}$, and $\delta^{34}S_{SO4}$) for better understanding the causes of groundwater deterioration. Our results showed that sulfate in the groundwater originates from multiple sources (pyrite oxidation, volcanic components and anthropogenic materials), but nitrate was mostly derived from anthropogenic sources. Anthropogenic impact to DIC was also assessed by using $\delta^{13}C_{DIC}$ data. This study showed that multiple-use of isotope tracers is advantageous for comprehensive understanding of the cause of water quality change. However, the utility of this approach should be developed as a better tool for elucidating the pollution attenuation mechanisms in future work.

Key words groundwater; quality change; multiple stable isotope ratios; Kumamoto area, Japan