Groundwater flow system in Fukushima Prefecture, Japan, traced by tritium-^{3}He and ^{129}I dating methods

M. SAKURABA[1]*, H. SUMINO[1] , T. MARUOKA[2] , H.MATSUZAKI[3] , H. KUSUNO[3], M. KAWAMOTO[3], H.TOKUYAMA[3], K. SHOZUGAWA[1], M. HORI[4]

[1] Dept. Basic Sci., Univ. Tokyo, Japan
(*correspondence: maiko.s@igcl.c.u-tokyo.ac.jp)
[2] Grad. Sch. Life Environ. Sci., Univ. Tsukuba, Japan
[3] MALT, Univ. Tokyo, Japan
[4] ADVES, Univ. Tokyo, Japan

For effective utilization of groundwater resources, it is necessary to understand the large-scale circulation of water [1]. In particular, studying the residence time and source of the water is important for evaluating the groundwater flow system. For Fukushima Prefecture, northeastern Japan, there are few reports on the behavior and contamination status of groundwater affected by radionuclides released by the accident at the Fukushima Daiichi Nuclear Power Plant triggered by the earthquake of 11 March 2011 off the Pacific coast of Japan and the subsequent tsunami. We are investigating the groundwater flow system in the Fukushima Hama-dori region and the anthropogenic contamination of groundwater caused by the nuclear accident using the ^{3}H–^{3}He dating method, with which it is possible to acquire the age of groundwater and information on the water source based on the initial ^{3}H concentration and ^{129}I, one of the radionuclides released by the nuclear accident.

For example, at Minami Soma Sports Park, located about 30 km north of the nuclear plant, the concentration of tritium-derived ^{3}He was approximately (0.0–5.0) × 10^{-19} mol/g. The current ^{3}H concentration for a sample collected from the same locality has been determined by liquid scintillation counter to be 9.3 TU [2]. These values give an initial ^{3}H concentration of 9.3–13 TU and a residence time of about 0–7 years. The ^{129}I/^{127}I ratio was 1.1 × 10^{-12}, which is lower than the lower limit of the isotope ratio (1.5 × 10^{-12}) of anthropogenic iodine [3]. Until the present, it has not been possible to confirm the apparent contamination due to the nuclear accident, but the possibility that polluted water might discharge in the future cannot be ruled out. We plan to carry out further sampling to estimate the residence time and water source by the above methods to investigate the environmental impact.

[1] Y. Mahara *et al.*, *J. Groundwater Hydrol.* 1993. [2] S. Yabusaki *et al.*, *J. Center Regional Affairs, Fukushima Univ.* 2015. [3] U. Fehn, *Annu. Rev. Earth Planet. Sci.* 2012.