Japan Geoscience Union Meeting 2011
(May 22-27 2011 at Makuhari, Chiba, Japan)

AHW023-01 Room:102 Time:May 25 08:30-08:55

Application of stable isotopes to nitrate contaminated groundwater. Review and prospect

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For a last couple of decades, researches on groundwater contamination by nitrogen have been done intensively and knowledge on identification of sources, contamination processes, natural attenuation or denitrification processes has been accumulated. Since nitrate contaminations are closely related to social conditions besides scientific knowledge, measures against the contamination are still left as a big social concern.

The nitrogen stable isotope has played an important role to identify contaminant sources of chemical and organic fertilizers, livestock manure, and domestic waste, and to investigate contamination processes and natural attenuation processes, but combinations of concentrations and isotope ratios cannot necessarily solve problems.

The author will try to review last 20 years research works, including authors case studies in Numata of Gunma Pref., Sugadaira of Nagano Pref., Miyako Island of Okinawa Pref., Kanekodai of Saitama Pref., Nasunogahara of Tochigi Pref., Kagamigahara of Gifu Pref., Sangawa of Kagawa Pref., and Tsukuba of Ibaraki Pref.. Main focuses are on joint or complementary uses of nitrogen isotope with other isotopes and elements such as oxygen, sulfur and carbon isotopes, chloride, sulfate, and bicarbonate ions, and urobilin, in order to analyze groundwater contamination processes and to solve the problems. Some perspectives are referred.