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Distribution and origins of nitrate in shallow groundwater in the Shakujii river catchment, central Tokyo, Japan

Masaya Yasuhara^{1*}, Akihiko Inamura¹, Mio Takeuchi¹, Atsushi Suzuki¹, Takeshi Hayashi², Kazuyoshi Asai³, Atsushi Yamamoto⁴, Hidekazu Suzuki⁵

¹Geological Survey of Japan, AIST, ²Akita University, ³Geo Science Laboratory, ⁴Kinki University, ⁵Hot Springs Res. Inst. Kanagawa Pref.

Water chemistry of shallow groundwater in the Shakujii river catchment in the downtown Tokyo is discussed with special reference to its nitrate and chloride concentrations. The catchment is divided into the highly urbanized lower reaches (Toshima, Kita and Itabashi Wards) and the upper reaches which have been urbanized to a lesser extent (Nerima Ward, and Nishi-Tokyo and Kodaira Cities). In 2009 and 2010, shallow groundwater samples were collected from ca.150 wells of less than 10m deep. Groundwater occurs in the Kanto loam layer and/or underlying stream terrace gravels.

As a result of the water chemistry analysis, shallow groundwater in the Shakujii river catchment proved to be characterized by a surprisingly high nitrate concentration with an average of 44.0mg/l in Toshima Ward; 39.3mg/l in Kita Ward; 39.4mg/l in Itabashi Ward; 39.4mg/l in Nerima Ward; 37.2mg/l in Nishi-Tokyo City; 26.7mg/l in Kodaira City. A maximum value of 231.9mg/l was found in the groundwater sample from Nerima Ward. The enriched delta-¹⁵N and delta-¹⁸O values of nitrate especially in the lower reaches suggest leaking sewers is a potential source of nitrate in shallow groundwater of the Shakujii river catchment.

Keywords: Tokyo metropolitan area, urban area, shallow groundwater, nitrate, chloride, leaking sewer