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An isotopic study on the origins of sulfate ion in shallow urban groundwater of the Musashino Plateau, Tokyo, Japan

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Shallow groundwater in the highly-urbanized Shakujii-gawa River basin on the Musashino Plateau, Tokyo, Japan shows a remarkable spatial variability of its sulfate ion concentration in the range between 7-135 mg/L. The average sulfate ion concentration is 35mg/L, 36mg/L, 33mg/L, 21mg/L, 19mg/L, and 28mg/L in Kita Ward, Itabashi Ward, Toshima Ward, Nerima Ward, Nishi-Tokyo City, and Kodaira City, respectively, indicating higher concentration in the lower reaches of the river where urbanization has started earlier and progressed more rapidly than its upper reaches. To discuss possible origins of sulfate ion in groundwater, a hydrologic study using stable isotope of sulfur was carried out in 2012 to 2013. Although a limited number of samples, higher sulfur isotope measurements (+10.5 and +10.6 per mil delta-34S for Toshima and Kita Wards, respectively) suggest contribution of leaking sewage from aging, deteriorated sewer pipes, accounting for an elevated sulfate ion concentration in the lower reaches of the river.

Keywords: urban groundwater, central Tokyo, shallow groundwater, sulfate ion, sulfur isotope