Japan Geoscience Union Meeting 2014
(28 April - 02 May 2014 at Pacifico YOKOHAMA, Kanagawa, Japan)

AHW26-P01 Room:Poster Time:May 1 18:15-19:30

Three-dimensional mapping of geochemical and isotopic characteristics of groundwater beneath the Osaka Plain

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Osaka Basin, which is a large Quaternary sedimentary basin beneath the Osaka Plain, is a large reservoir of groundwater resources. The uptake of groundwater has been strictly regulated since 1960 to avoid land subsidence, which actively occurred in the period of rapid economic growth. Although the land subsidence has stopped since 1970s because of the regulation, it became a threat again due to start of uptake of groundwater for private water supplies after 2000 ' s. Excess groundwater uptake from 100 to 300 m depths for those purposes would squeeze porewater from impermeable marine clay layers causing subsidence again.

In this study, groundwaters were mainly sampled from the wells >100 m depths, and stable hydrogen and oxygen isotope ratios and major chemical components were determined to estimate origins of water. Combining the results of our and previous studies, overall picture of three-dimensional mapping of groundwater geochemistry was drawn to discuss the groundwater flow system and the relationship to the land subsidence.

In the coastal region below sea level, seawater invaded into the groundwater aquifers <100 m depth. Stable isotope ratios of the groundwater at >100m of this area(δ^2H:-50 ‰~ -60 ‰,δ^{18}O:-8 ‰~ -9 ‰) is smaller than those of groundwater at <100m(δ^2H:-40 ‰~ -50 ‰,δ^{18}O:-6 ‰~ -7 ‰). Especially low isotope ratios of the groundwaters, of which chemistry was diluted Na-HCO3 type, from the lowland west of Uemachi plateau suggest squeezing the pore water from clay layers.

In the same area, high electric conductivity and Na-Cl type chemistry indicates seawater invasion into the groundwater aquifers <100 m depth. Uemachi Fault works as recharging path for the groundwater aquifers <100 m along the western edge of Uemachi plateau. However, the recharge is not enough to fill the aquifer >200 m apart from the fault. These observations indicate that the aquifers in the aquifers beneath western lowland of Osaka Plain have not been recovered by newly recharged groundwater.

Keywords: groundwater, isotope

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Source of nitrate in shallow groundwater in the Shakujii river catchment, central Tokyo, Japan

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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). Shallow groundwater samples were collected from 28 wells of less than 10m deep at October 2012 and October 2013. Groundwater aquifer is in the Kanto loam layer and/or underlying stream terrace gravels. The nitrate-nitrogen concentration had wide ranges (from 0.1 to 13.6mg/l). The total coliform was detected from all shallow groundwater samples. The nitrate nitrogen isotope ranges from 5.6 to 12.3 permil, which overlaps fertilized soil and wastewater nitrogen. Moreover, End-member mixing analysis using hydrogen and oxygen isotope values revealed spatial distribution in the contribution ratios of the local precipitation and domestic water (sewage and tap). The concentration of nitrate nitrogen and total coliform was increasing along with contribution ratios of precipitation in shallow groundwater, except some samples that has high nitrogen isotope and chloride concentration. This trend suggests that the nitrate source in this area is not only from sewage leakage. It also needs to consider the loading of the nitrogen fertilizer to shallow groundwater by the precipitation infiltration.

Keywords: tokyo, urban, groundwater, nitrate nitrogen and oxygen isotopes