Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)

AHW27-P01 Room:Convention Hall Time:May 22 18:15-19:30

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). In 2012 shallow groundwater samples were collected from 24 wells of less than 10m deep. 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. Vice versa the *Escherichia coli* was not detected. The nitrate nitrogen isotope ranges from 5.6 to 11.7 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, Shallow groundwater, Nitrate nitrogen and oxygen isotopes

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Groundwater level and Cl- concentration in man-made strata and natural strata beneath Tokyo bay area, Chiba Japan

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We investigated Cl- concentration in groundwater and pore water in the latest Pleistocene to Holocene incised-valley fills beneath Tokyo bay area.

Analyses of pore water revealed that Cl- concentration is influenced by the topography of incised-valley of Holocene and the latest Pleistocene.

Keywords: liquefaction-fluidization, chloride concentration, incised-valley fills, groundwater flow

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Reconstruction of the thermal environment evolution from subsurface temperature distribution in Japan and Thailand

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Temperature changes at the ground surface propagate into the underground and disturb the subsurface temperature structure. Analyzing the disturbance in the subsurface temperature structure, we can reconstruct the past ground surface temperature (GST) change, which is closely related to the past surface air temperature change. This method can be applied to studies of thermal environment evolution in urban areas such as the development of heat islands. We have been investigating GST histories in the northwestern part of the Kanto area (Saitama prefecture), Osaka area, and Bangkok area (Thailand). The Kanto area and Osaka area have the greatest and second greatest population in Japan respectively. Bangkok area has the greatest population in Thailand.

We conducted measurements of temperature profiles in boreholes at total 25 sites in the northwestern of Kanto area (measured from 2009 to 2013), at total 31 sites in Osaka area (2003, 2009, 2011), and at total 45 sites in Bangkok area (measured in 2006, 2007, 2008, and 2010). In the measurements, we used high resolution temperature measurement system (resolution: 0.003K) in the northwestern part of Kanto area after 2012. We examined the shapes of the temperature profiles and selected ones that are not significantly disturbed by groundwater flow. Reconstruction of GST history for the last about 300 years was made at two sites in the northwestern part of Kanto area, at six sites in Osaka area, and at six sites in Bangkok area. We used latest temperature profiles at each station in the case existing several different measured date. We used a multi-layer model that allows layers with different thermal properties, determining layer boundaries based on lithology of the formations around the boreholes. All of the reconstructed GST histories show surface warming in the last century.

The amount of the temperature increase is 2.5 K and 4.0 K for a period from 1900 to 2010 in the northwestern part of Kanto area, ranges from 3.0 K to 5.0 K for 1900 to 2010 in Osaka area and ranges from 0.4 to 2.6 K for 1900 to 1990 in Bangkok area. A common feature was found in distribution of the GST increase in Osaka and Bangkok areas: the GST increase is large at the city centers and industrial areas, while it is small in the suburbs. The tendency is consistent with the characteristics of heat island effect. Recent temperature increase rate at the city center of Osaka is much higher than those at the other sites. These results may reflect difference in the degree of urbanization and/or human activities.

Keywords: ground surface temperature histories, heat island, landuse, subsurface temperature distribution