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荒川低地沖積堆積物における地下水質と間隙水組成
The groundwater quality and pore water composition of alluvial deposit in Arakawa Lowland, Japan

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The ground source heat pump (GSHP) has been recognized as one of the most energy conserving systems. However, there is a possibility that the thermal disturbance by using the system might affect the subsurface environment including groundwater quality. In this study, the geochemical properties of the groundwater and pore water were discussed to assess the impact of GSHP on subsurface environments.

Three boreholes of 50 m depth were excavated in the campus of Saitama University and groundwater monitoring wells were installed with two strainers for the upper (GL-16.25 m to 17.80 m) and the lower (GL-38.70 m to 40.15 m) aquifers for each well. The groundwater was sampled from both aquifers for several times from October to November, 2011. Also the pore water was extracted by dilution method (dry sample: water = 1: 10) from twenty-one core samples obtained from one of three boreholes. The water quality such as pH, EC, DO, ORP, inorganic dissolved ions, heavy metals and dissolved gases were measured for the groundwater. Only inorganic dissolved ions and heavy metals were measured for the pore water.

In the lower aquifer, the groundwater showed Ca-HCO3 type, while in the upper aquifer, it was Na, Mg-HCO3 type and also contained higher concentrations of the dissolved components (EC), Li, B and Sr as compared to the lower aquifer. This might be because the upper aquifer consists of marine sediment. For both aquifers, DO and ORP showed low values and only NH4+ was detected as inorganic nitrogen. The dissolved gases such as H2S and CH4 were detected but almost no SO42- in the groundwater. These facts suggested that the groundwater in both aquifers is under the methanogenesis environment.

High concentrations of heavy metals such as As, Cr, Al and Fe were detected in the pore water of the layer below GL-40 m compared to upper layers. The pore water also contained higher concentrations of heavy metals with comparison to the groundwater. These results imply that heavy metals might dissolve to the groundwater with increase of the subsurface temperature.

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