

Change in groundwater quality during the long term thermal loading and cooling

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Recently, the subsurface temperature increase due to global warming, heat island phenomenon, the waste heat from the underground structures and some other causes has been observed worldwide. Increase in subsurface temperature might affect groundwater quality (e.g., dissolution of toxic substances such as heavy metals in the soil, generation of metabolic substances by the change of microbial activity). But its effects are not well understood. Therefore, the purpose of this study is to investigate the effects of subsurface temperature increase on groundwater quality. In this study, the subsurface heat exchanger installed in the experimental site at Saitama University campus and water of 40 °C and 60 °C was circulated in the heat exchanger for the thermal loading test. The groundwater quality was measured at four monitoring wells with two aquifers. As a result of thermal loading, the concentration of several components (K, Na, NH₃, B, Li, Si, As) increased with subsurface temperature increase, while the concentration of a few components (Mg, Ca) decreased. These results show that the subsurface temperature increase affects groundwater quality.

Keywords: groundwater quality, subsurface temperature, thermal loading