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Sources and recharge process of groundwater in sub-urban area of Hanoi city, Viet Nam

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Water demand in Hanoi city, the capital of Viet Nam, has been increased with recent rapid urbanization. Although high concentration of Arsenic is contained, groundwater is one of important water resources in this city. Groundwater abstraction has induced depletion of groundwater levels in major aquifers (Holocene shallower aquifer and Pleistocene deeper aquifer) not only in the central area but also sub-urban areas. On the other hand, urbanization reduces the surface water areas such as ponds, rivers and canals, and paddy fields. We focus on the interaction between surface water and groundwater to clarify water cycle and solute transport process in Hanoi area for sustainable water resource management. We are carrying out regular measurement of geochemical properties of surface water and groundwater, monitoring of groundwater levels in the major aquifers, and evaluation of groundwater age in some sub-urban villages.

The result of our previous study shows the surface water with evaporation process is a major source of groundwater in the study area. From the result of the regular measurement of surface and ground water and monitoring of groundwater levels in the shallower aquifer (unconfined condition), we found seasonal change of groundwater levels and geochemical properties of groundwater related with fluctuation of rainfall between rainy season and dry season. Also, seasonal change of geochemical properties was delayed several months to that of groundwater levels. This difference suggested the relatively slow infiltration of surface water with evaporation process into the shallower aquifer. On the other hand, result of CFCs and SF6 measurement showed apparent groundwater age in the shallower aquifer of the study area is several decades. These results may suggest groundwater abstractions enhance water cycle in the study area.

Keywords: Hanoi city, groundwater recharge process, fluctuation of groundwater level, isotopes, groundwater age