



## **Radon as a tracer to characterize the interactions between groundwater and surface water around the ground source heat pump system in riverside area**

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The interaction characteristics between groundwater and surface water was examined by using Radon-222 at Han River Environmental Research Center (HRERC) in Korea where a geothermal resource using indirect open loop ground source heat pump (GSHP) has been developed. For designing a high efficiency performance of the open loop system in shallow aquifer, the riverside area was selected for great advantage of full capacity of well. From this reason groundwater properties of the study site can be easily influenced by influx of surrounding Han River. Therefore, 12 groundwater wells were used for monitoring radon concentration and groundwater level with fluctuation of river stage from May, 2014 to Apr., 2015. The short term monitoring data showed that the radon concentration was changed in accordance with flow meter data which was reflected well by the river stage fluctuation. The spatial distribution of radon concentration from long term monitoring data was also found to be affected by water level fluctuation by nearby dam activity and seasonal effect such as heavy rainfall and groundwater pumping. The estimated residence time indicates that river flows to the study site change its direction according to the combined effect of river stage and groundwater hydrology. In the linear regression of the values, flow velocities were yielded around 0.04 to 0.25 m/day which were similar to flow meter data. These results reveal that Radon-222 can be used as an appropriate environmental tracer in examining the characteristics of interaction in consideration of fluctuating river flow on operation of GSHP in the riverside area.

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