Goldschmidt 2022 Abstract
https://doi.org/10.46427/gold2022.9536

Impacts of shallow geothermal system on groundwater characteristics using hydrochemistry, multiple isotopes, and microbial analysis

JAEYEON KIM, KANG-KUN LEE, JIYOUNG BAEK, DUGIN KAOWN, HYE-NA KO AND HAERIM OH

Seoul National University

Presenting Author: jaeyon3@snu.ac.kr

As a perspective of carbon neutrality, groundwater, which is one of the environmental tool to reduce greenhouse effect, can be a sustainable thermal resource in a geothermal system. This study aims to inverstigate the impacts of an open loop groundwater heat pump (GWHP) on shallow groundwater system from the view of groundwater mixing and contamination for long-term sustainable operations. For this, we monitored continuous data of groundwater level and temperature, hydrogeochemical parameters, stable isotopes (O, H, and Sr), radon isotope, and microbial community composition before, during, and after the operations of the system. Continuous data of groundwater level and temperautre, and multiple isotopes showed the changes in overall geothermal field. Especially, radon concentrations indicated the mixing processes with deep groundwater along main groundwater flow direction during the operations by quantitative interpretation using mixing ratio calculation. Calculated saturation index (SI) by PHREEQC geochemical modeling also showed the clogging effect in some wells, not located along the main groundwater flow. In accordance with these, microbial diversity had specific characteristics with the operations. That is, overall results can suggest the extensive management in the wells located on nearby the main groundwater flow. Also, this study comfirms that combined analysis of hydrogeochemistry, multiple isotopes, and microbial community data can be effectively used to identify the groundwater system characteristics related to the geothermal system operations.