Geophysical Research Abstracts
Vol. 21, EGU2019-3887, 2019
EGU General Assembly 2019


# Environmental isotopic and hydrochemical studies on geothermal groundwater circulation in Heyuan Fault Zone, Southern China

Xiaolin Qiu (1,2), Ya Wang (1,2), Zhongzheng Wang (3), and Klaus Regenauer-Lieb (4)

(1) Sun Yat-sen University, School of Earth Sciences and Engineering, Guangzhou, China (qiuxl6@mail2.sysu.edu.cn), (2) Southern Laboratory of Ocean Science and Engineering, Zhuhai, PR China, (3) Department of Civil and Environmental Engineering, The Hong Kong University of Science and Technology, Hong Kong, PR China, (4) School of Petroleum Engineering, University of New South Wales, Sydney 2052, Australia

With numerous hot springs and active neotectonic movements, Heyuan Fault Zone is a typical medium-low temperature geothermal system in Southern China, where has abundant under-exploited medium-low temperature geothermal resources. For a better exploration of these resources, multiple isotopic and hydrochemical techniques were used to study the circulation of geothermal groundwater in Heyuan Fault Zone, Southern China. According to the discussion of helium and neon isotopes from the hot springs, gases of the geothermal groundwater are mainly derived from the crust instead of the mantle, implying that the circulation of the geothermal groundwater is not related to the extremely deep fault. The $^{2}H$ and $^{18}O$ results of both groundwater and surface water suggest the geothermal groundwater is recharged by local meteoric precipitation, and the recharge elevation ranges from 440$\sim$670 meters, which is the outcropped granite zone. Moreover, radon activity ($^{222}Rn$) of the hot spring waters is up to 704 kBq/m$^3$, and this also suggest the recharge area is the surrounding granite zone. The calculation of silica geothermometer shows that the reservoir temperature of geothermal groundwater in Heyuan Fault Zone can reach to about 157 ˚C. With a local geothermal gradient of 21.1 ˚C/km, the corresponding circulation depth is about 6.5 km. The results of carbon-14 isotope suggest that the circulation time may range from 9.9 to 12.3 thousand years. According to the characteristics of $^{2}H$, $^{3}H$, $SiO_2$ and $Ca^{2+}$ of the hot spring waters, it can be inferred that the mixing of geothermal groundwater with shallow cold groundwater occurred significantly during the geothermal water ascending process, and results in the decrease of hot water temperature and the alteration of hot water composition.