



## Geochemical Characteristics of Aquifer system in Taichung Area, Central Taiwan

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For understanding the relationship between water bodies and host rocks and getting more information for groundwater in Taichung area, Central Taiwan, we systematically analyzed the stable isotopes (hydrogen and oxygen), helium isotopes and radon concentrations of dissolved gases from 54 groundwater, 39 river and 4 rain samples collected from Taichung Basin in wet and dry seasons of the year 2015.

In the  $\delta^{18}\text{O}$  vs.  $\delta\text{D}$  plot, all samples present a linear trend similar to local meteoric water, indicating a meteoric origin. However, river samples are relative lighter than rain samples, it appears that the rivers are mainly recharged from precipitation of high-elevation areas with a lighter isotopic composition. Because the seasonal isotopic variation of river samples is significant, we calculated relative contribution of precipitation by seasons using the mass balance equation. Results show that the precipitation in the rainy season is the major source of groundwater.

The helium isotopic ratio in dissolved gases of most groundwater samples are close to 1  $R_A$  ( $R_A = {}^3\text{He}/{}^4\text{He}$  ratio of air), except the sample from Wu-Feng well that exhibits 0.3  $R_A$ . This sample also has an older C-14 age ( $\sim 27000$  yrs.) than others ( $< 200$  yrs.), implying that the dissolved helium is likely affected by radiogenic  ${}^4\text{He}$  of surrounding rocks. The average concentration of radon for groundwater in the northern section of Taichung Basin is 20.3 Bq/L, which is higher than that of the southern section (14.5 Bq/L). Variations of radon concentrations in the two sections may be related to the different drainage systems (Paleo-Dajia River vs. Wu River), in which sediments from Paleo-Dajia River may contain higher uranium concentrations. On the other hand, water in rivers usually contains undetectable radon ( $< 0.37$  Bq/L) because it rapidly escapes to the atmosphere. However, river samples from the central part of basin have radon concentrations ranging between 1 and 3 Bq/L, reflecting that the sampling sites are in the vicinity of points of groundwater inflow.

This study illustrates the utility of hydrogen and oxygen isotopes to trace the groundwater source and determine the seasonal contribution ratios of precipitation to groundwater recharge, and demonstrates the advantage of using dissolved gas to investigate the groundwater-host rocks interaction.

**Key words:** Central Taiwan, groundwater, dissolved gas, helium isotope, hydrogen and oxygen isotopes, water radon