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Gas composition and hydrochemistry of non-volcanic thermal springs in Peninsular Malaysia

Lim Wuh Terng (1), Yang Tsanyao F (1), Chen Hsuan-Wen (1), and Ismail Bin Yusoff (2)

(1) Department of Geosciences, National Taiwan University, No. 1, Sec. 4, Roosevelt Road, Taipei 10770, Taiwan (limwuhterng7@hotmail.com), (2) Department of Geology, Faculty of Science Building, University of Malaya, 50603 Kuala Lumpur, MALAYSIA

Peninsular Malaysia is located on Sunda Plate which situated between two major boundaries of tectonic plates, Australian Plate and Eurasian Plate. Over sixty thermal springs have been reported in Peninsular Malaysia, a non-volcanic country, but their water and gas geochemistry characteristic have not been reported yet. The aim of this study is to identify the geochemical characteristics of water and gas samples from selected sixteen thermal springs. This is the first time to study the thermal springs in Peninsular Malaysia in terms of dissolved gas. Due to the chemical inertness, the concentration and isotopic composition of dissolved gas can always become a good indicators of mantle degassing, geothermal circulation and the condition of water-rock interaction. Other parameters such as pH, temperature, electric conductivity, and water radon values will be also recorded. The surface temperature of studied thermal springs range from 40.1˚C to 88.7˚C, the pH values range from 6.6 to 9.1, and the conductivity varies between 200 μs/cm and 3700 μs/cm. Meanwhile, the water radon analysis which been carried out in the field by using RAD7 Radon Detector. The water radon values of selected thermal springs in Peninsular Malaysia vary from 111,866 Bq/cm^3 to 200 Bq/cm^3, indicating various radon sources which mainly controlled by the permeability and lithology of host rocks in studied areas. Analysed results show that the constituent of dissolved gas in thermal springs is major in nitrogen and minor in other compositions such as argon, carbon dioxides and oxygen. Isotopic composition of hydrogen (D/H) and oxygen (^{18}O/^{16}O) mostly fall along the MWL, indicating the meteoric water is the major fluid source for those hot springs. However, the helium isotopic ratios of most samples show consistently low value, less than 0.1 Ra (Ra is the ^{3}He/^{4}He ratio of the air). It implies that crust component is the major helium gas source for those hot springs.