Isotopic study of hydrocarbons from on–land serpentinite–hosted hot spring in Hakuba Happo, Japan

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The early environment before the origin of Earth’s life remains poorly understood due to lack of geological records during Hadean era (>4.0 Ga). Serpentinite–hosted hot spring/hydrothermal systems are considered to have been widespread in Hadean Earth and a potential site for abiotic organic synthesis (e.g., [1]). Previous field studies revealed that saturated hydrocarbons are common in serpentinite–hosted systems, regardless on–land or seafloor setting (e.g., [2] [5]). However, production mechanisms of these hydrocarbons are still poorly constrained, as well as their chemical and isotopic signatures. Here, we report chemical and isotopic study of hydrocarbons for on–land serpentinite–hosted system; Hakuba Happo hot spring in Japan. The spring waters from two wells of Hakuba Happo were around 50°C and high pH (~10.5). The main gas components were N2, H2 and CH4 [6]. Saturated hydrocarbons from C2 to C5 were detected in both wells. Hydrocarbons in two wells showed different carbon isotopic trends from C1 to C5. One showed isotopic decreasing trend with increasing carbon number which is similar to the seafloor serpentinite–hosted hydrothermal field Lost City [3]. We have conducted the intramolecular stable carbon isotopic analysis of propane and discuss the process of hydrocarbon generation in serpentinite–hosted systems.