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

K. SUDA[1]*, A. GILBERT[2] AND Y. UENO[123]

[1]Department of Earth and Planetary Sciences, Tokyo Institute of Technology, Meguro, Tokyo, 152-8551, Japan (*correspondence: suda.k.ag@m.titech.ac.jp)
[2]Earth-Life Science Institute (WPI-ELSI), Tokyo Institute of Technology, Meguro, Tokyo, 152-8551, Japan
[3]Precambrian Ecosystem Laboratory, Japan Agency for Marine-Earth Science and Technology (JAMSTEC), Natsushima-cho, Yokosuka, 237-0061, Japan

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 isotopis 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 N_2, H_2 and CH_4 [6]. Saturated hydrocarbons from C_2 to C_5 were detected in both wells. Hydrocarbons in two wells showed different carbon isotopic trends from C_1 to C_5. 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.

[1] Russell *et al* (2010) *Geobiology* **8**, 355–371. [2] Charlou *et al* (2002) *Chem. Geol.* **191**, 345–359. [3] Proskurowski *et al* (2008) *Science* **319**, 604–607. [4] Etiope *et al* (2011) *EPSL* **310**, 96–104. [5] Szponar *et al* (2013) *Icarus* **224**, 286–296. [6] Suda *et al* (2014) *EPSL* **386**, 112–125.