# Microbial community analysis of deep-seated fluids: Do microbes live in slab-derived fluid?

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Microbes are present under various environments and their distribution in the subsurface environment extend for several kilometers. The distribution of microbes in the environment reflects environmental conditions such as temperature, pH, nutrients. Understanding the microbial community in the groundwater might be elucidated the origin of groundwater and difference in the groundwater flow paths. However, little is known the microbial communities in slab-derived fluid, which is characterized by high temperature, high salinity and high $CO_2$ concentration. In this study, we analyzed the microbial community in groundwater, which is considered to be contribution of slab-derived water, and examined whether the origin and mixing of groundwater could be estimated from microbial analysis.

The 11 groundwater samples were collected from hot and cold springs at different locations. The temperature measured at the outflows ranged from 7.4°C to 41.2°C. The value of pH and the electric conductivity ranged from 6.26 to 8.14, from 129 mS/m to 5050 mS/m, respectively. The density of microbes ranged from 2.2 x $10^3$ cells/mL to 9.3 x $10^5$ cells/mL. 16S rRNA gene sequencing, 110,000 to 390,000 reads were obtained, and they belonged to 44 to 56 phyla. The relative ratio of archaea, which mainly live in extreme environments, accounted for 0.2% to 17.4%. At all sites, *Methanomicrobia*, *Methanobacteria* and *Methanococci* dominated. In some samples, hyper-thermophilic archaea, *Archaeoglobi* and *Thermococci*, and highly halophilic archaea, *Halobacteria*, were detected. The detection of these hyper-thermophilic and highly halophilic microbes suggests that the examined groundwater experienced a high temperature and high salinity environment, and the contribution of slab-derived water as the origin of the groundwater could be considered. We will perform further analysis and examine the possibility of evaluating the origin and mixing of groundwater using microbes.

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