Microbial sulfate reduction and sulfur cycle below S. Chamorro serpentinite seamount

S. AOYAMA[1*], Y. UENO [1,2,3], M. NISHIZAWA[3], J. MIYAZAKI[3], K. TAKAI[2,3]

[1]Tokyo Institute of Technology, Tokyo, 152-8551, Japan (*correspondance: aoyama.s.ab@m.titech.ac.jp)
[2]Earth-Life Science Institute (WPI-ELSI)
[3]Precambrian Ecosystem Laboratory, Japan Agency for Marine-Earth Science and Technology (JAMSTEC)

Identifying microbial activity under unique conditions is important for astrobiology to define the boundary of habitable or non-habitable zones. Serpentinite seamounts in Mariana fore-arc are kind of extreme environment due to high pH over 12 and few supply of organic carbons. The activity and substrate sulfate of microbial sulfate reduction in this high alkaline environment is still unknown. In order to understand sulfur cycle, biological activity related to sulfur and sulfate origin in the serpentinite system, we analysed quadruple sulfur isotopes of sulfide minerals in core and sulfate in pore water, as well as sulfate and hydrogen sulfide dissolved in deep-derived fluids (CORK), collected at the South Chamorro serpentinite seamount, Mariana fore-arc. The sulfide minerals are depleted in ^{34}S relative to seawater at any given depth. The degree of ^{34}S depletion is consistent with the sulfate concentration in pore water: sulfide sulfur in sulfate-rich zone is more depleted in ^{34}S (–30‰) whereas sulfide sulfur in sulfate-depleted zone is closer to seawater value (+0-15‰). Pore water sulfate shows, however, the substrate sulfate is not seawater but sulfate which is slightly but obviously depleted in both ^{34}S & ^{33}S. This substrate sulfate might be a mixture of seawater sulfate and sulfate in fluids derived from deep part ($\Delta^{33}S \cong -0.2$), though the origin of this mass-independent is unknown. Our numerical calculation suggests microbial sulfate reduction is involved over 55 m of the core, but cannot constraint in the deep derived fluids probably due to high fraction of sulfate reduction.