Sulfur cycling in oceanic and continental ultramafic-hosted hydrothermal systems

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Serpentinization of ultramafic rocks has a significant influence on the cycling of elements between the hydrosphere, lithosphere and biosphere. Along mid-ocean ridge spreading centers exposure of mantle rock to seawater allows incorporation of seawater-derived carbon and sulfur storing these elements over millions of years. In contrast, in continental serpentinization environments meteoric water interacts with obducted ultramafic rocks but producing chemically very similar fluids. In both environments microbial activity is supported through abiogenic formation of hydrogen and reduced organic compounds during serpentinization, specifically hosting sulfur-metabolizing organisms [1] [2]. However, the role of sulfur cycling, and especially microbial sulfate reduction, in continental serpentinization environments is still not well constrained because sulfur signatures produced during continental water-rock interaction are mixed with those formed during oceanic serpentinization and processes during exhumation and emplacement.

Here we present data of the sulfur geochemistry of oceanic serpentinites from the Northern Apennine ophiolite, Ocean Drilling Program Legs 149, 173 and 209, and of samples from continental serpentinization environments from the Santa Elena ophiolite in Costa Rica and the Voltri Massif in Italy [3]. The aim of this project is to distinguish between oceanic and continental serpentinization processes using multiple sulfur isotope analyses and geochemical modeling. Overall, serpentinized peridotites have a large range of bulk rock sulfide and sulfate isotopic compositions. Microbial sulfate reduction is the dominant process in oceanic serpentinites. However, geochemical modeling of the Santa Elena ultramafics provide evidence that $\delta^{34}S_{sulfide}$ values of up to +23.1‰ were produced by abiogenic reduction of sulfate during water-rock interaction.

[1] Brazelton et al., 2006. *Applied and environmental microbiology* **72**, 6257-6270. [2] Schrenk et al., 2013. *Reviews in Mineralogy and Geochemistry* **75**, 575-606. [3] Schwarzenbach, 2011. *ETH Zurich, Thesis No. 19588*, p. **240**.