Exploration of subsurface microbial communities within seafloor mantle rocks

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Ultramafic rocks in Earth's mantle represent a tremendous reservoir of carbon and reducing power. Mixing of these rocks with overlying seawater due to tectonic uplift causes an exothermic reaction known as 'serpentinization' that also releases hydrogen gas, methane, and small organic molecules[1].

The H_2 and CH_4-rich environments provided by serpentinization reactions are thought to be analogous to conditions found on the early Earth and perhaps other planets[2][3].

During October-December of 2015 the International Ocean Discovery Program Expedition 357 to the Atlantis Massif collected rocks from a subseafloor site of active serpentinization for the first time. The main goals of this project are:

1) to characterize the diversity, genomic content, and metabolic potential of microbial communities that inhabit the serpentine rocks collected from the Atlantis Massif and,

2) to distinguish endemic microbial communities of serpentine subsurface rocks from seawater residents and other potential sources of contamination.

Initial analyses of the next-generation sequencing results from the environmental DNA of the subsurface rocks showed that the rock samples were inhabited by some intriguing bacterial taxa that could be endemic subsurface microbes and were not found in our control samples for contamination. These preliminary results indicate that our efforts have been at least partially successful in 1) avoiding overwhelming contamination of the rock core samples and 2) overcoming technical difficulties to extract, purify, and sequence DNA from the rock cores.

These results represent the first DNA sequencing study ever conducted on subseafloor serpentine rocks.

References: [1] McCollom, T. M., & Seewald, J. S. (2007) *Chemical Reviews*, *107*, 382-401.[2] Schulte, M., et al. (2006) *Astrobiology*, *6,* 364-376. [3] Russell, M. J., et al. (2010) *Geobiology*, *8*, 355-371.