SEASONAL AND EPISODIC MICROBIAL COMMUNITY DYNAMICS OF THE COAST RANGE OPHIOLITE MICROBIAL OBSERVATORY (CROMO), CALIFORNIA. L.I. Williams[1], M.D. Kubo[2], M.C. Sabuda[1], D. Cardace[3], M.O. Schrenk[1], [1]Michigan State University, 288 Farm Ln, East Lansing, MI 48824, will3129@msu.edu, sabudama@gmail.com, mattoschrenk@gmail.com, [2] SETI Institute & NASA Ames Research Center, Building 239 Room 327, Moffett Field, CA 94305, michael.d.kubo@nasa.gov, [3]University of Rhode Island, 9 E. Alumni Ave, Kingston, RI 02881-0816, cardace@uri.edu.

Introduction: The Coast Range Ophiolite Microbial Observatory (CROMO) is a series of eight groundwater wells within serpentine soils and ultramafic bedrock in Lake County, CA (USA). Since the wells were drilled in August 2011, they have been monitored for geochemistry, microbiology, and hydrogeology. Sequencing and culturing efforts thus far have indicated that microbial diversity is low within the groundwater network, and has constrained carbon and sulfur species that are used by organisms in the system (1). The time-series geochemical and 16S rRNA sequence data that has been compiled over the past six years is being analyzed using bioinformatic and statistical tools to investigate how groundwater microbial communities change as a result of seasonal variations and perturbations to the environment. CROMO is situated in a dynamic location that is subject to drought, floods, wildfires, and earthquakes, all of which could influence the activities of subsurface microbial communities. Preliminary data from in-situ dataloggers that were placed in 2014 have shown significant water table and temperature changes on a seasonal basis as well as captured more significant perturbations to the area such as wildfires and earthquakes. In addition to this, measures of cell abundance also seem to fluctuate throughout the year which could be the result of seasonal changes in the environment. Looking at how microorganisms react to changes in the environment is vital to both better understanding geochemical components of the system as well as the range of conditions certain organisms can survive. The combination of geochemical, hydrologic, and microbiological data is being analyzed to test for correlations between environmental variables and sequences and to determine the most significant factors within the system. The results of these analyses should indicate major geochemical and hydrologic drivers within the groundwater system as well as indicate how the subsurface community responds to changes within the environment.

Understanding how microbial communities in serpentinite subsurface systems respond to environmental changes is vital to better understanding microbial ecology, as well as how tolerant the populations are to a variety of conditions. Determination of more common or resilient organisms in the ecosystem, as well as specialist organisms in the community is useful, as the more robust or specialist microorganisms could be enriched for in sampling trips to terrestrial planets that have similar geologic conditions. A useful application of this research could be on Mars. Mars is a terrestrial planet that is known to be subject to seasonal changes and shows evidence that water may have been present on the surface at one point. Serpentinite rocks have been found on the surface, and researchers have speculated that subsurface serpentinization could be the source of methane that is found in the Martian atmosphere. With continued research and the possibility of a serpentinizing subsurface on Mars, understanding how serpentinite subsurface microbial communities react to seasonal changes and different environmental conditions could be very applicable to the search for life on Mars.

References:

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