Session 11: Biofilm Metabolism

Thursday, October 11, 2018, 10:50 am - 12:25 pm

Deconstructing Metabolic Webs of Microbiomes in Biological Soil Crusts

T. R. Northen; Lawrence Berkeley National Laboratory, Berkeley, CA.

Microbes govern Earth’s elemental cycles and are increasingly recognized for their importance in plant and animal health. Biological soil crusts (biocrusts) are communities of organisms inhabiting the upper layer of soil in arid environments and are thought to be the Earth’s largest biofilm. Biocrusts organisms persist in a desiccated dormant state for extended periods of time and experience pulsed periods of activity following infrequent rainfall events. *Microcoleus vaginatus*, a non-diazotrophic filamentous cyanobacterium, is the ‘ecosystem engineer’ in many biocrusts, driving the biocrust formation through production of extracellular polysaccharides. It is also the key primary producer in biocrusts in the Colorado Plateau that are the focus of our research. Previously, we observed strong exometabolite niche partitioning among biocrust bacterial isolates enabling predictions of nutrient exchange between biocrust organisms. We have recently extended these findings by using our isolate data to link the relative abundance of four dominant bacteria to soil exometabolites in intact biocrust across a simulated wetting event and biocrust developmental stage. Overall, we found that most soil metabolites displayed the expected relationships (positive or negative correlation) with organism abundances. Demonstrating that integrating metabolite profiling, sequencing, and exometabolomics can be used to interpret metagenomes and provides a functional link between biocrust microbial community structure and chemical composition. These data will enable development of increasingly accurate models describing the linkages between biocrust community structure and nutrient cycling.