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Exploring the biogeochemistry of ultra-basic serpentinite-hosted springs using a multidisciplinary approach

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Ultra-basic, serpentinite-hosted groundwater springs represent locations of extreme pH for life (i.e. >11). Additionally, these springs are limited in bio-accessible inorganic carbon (i.e. bicarbonate ions) and common electron acceptors (e.g., molecular oxygen, nitrates, sulfates, carbon dioxide). Conversely, the chemical gradients that exist at the surface of serpentinite-hosted springs provide energy and new sources of carbon that may be useful for near-surface life. Furthermore, these subsurface environments may protect microorganisms from solar winds on other planetary bodies without a magnetic shield. Consequently, the biogeochemistry of serpentinite-hosted springs have been studied as terrestrial analogs of other planetary bodies such as Mars, Enceladus, and Ceres.

This presentation will bring together data from multiple disciplines including aqueous and isotopic geochemistry (including radiogenic, stable, and clumped), microbiology (including virology), and lipid biomarkers. The goal of this study is to understand the habitability, potential metabolisms, microbial compositions, and biosignatures characteristic of serpentinite-hosted systems. These data were collected from springs issuing from three ophiolites: Bay of Islands, NL, CAN; Trinity, CA, USA; and Coast Range, CA, USA. These sites were selected as endmembers of serpentinite-hosted biogeochemistry with respect to methane source and available electron donors and acceptors.