

Linkages between dynamic recharge, serpentinization, and subsurface microbial processes in the Santa Elena Ophiolite, Costa Rica

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The Santa Elena Ophiolite (SEO) in western Costa Rica experiences extreme wet-dry cycles on an annual basis with most of its' rainfall occurring in a few-months period between May and October. Geochemical and hydrological data indicate that groundwaters in the SEO have short residence times (a few months) and are strongly influenced by subsurface serpentinization reactions. Microbial abundances and diversity appear to be linked to this dynamic recharge and mixing cycle, with many of the taxa identified related to known methane- and hydrogen- oxidizing microorganisms. At the same time, nutrients and oxidants appear to be carried by the infiltration of meteoric water and are strongly correlated with microbial community compositions. Taken together these data demonstrate how dynamic processes related to fluid flow in the subsurface impact microbial communities and carbon cycling. Results from this study provide insight into the physiology and metabolic capabilities of serpentinite-hosted microbial communities and help to constrain temporal dynamics in rocky subsurface environments.