Mineralogy selects microbial community characteristics at low-temperature along the global mid-ocean ridge

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Environmental factors influence microbial ecology and biogeography; however, master variables contributing to observed species distributions in many environments remain uncertain. Here we evaluate the spatial patterns in rock-hosted microbial diversity in deep-sea mid-ocean ridge settings. The membership, richness, and structure of bacterial communities from the chimneys and massive sulfide deposits of East Pacific Rise (EPR) 9°N were measured/estimated from 16S rRNA gene sequence data. The phylogenetic data for these communities were compared with previously reported data from globally distributed deep-sea vent sites representing seven vent fields in three ocean basins, including: Edmond and Kairei (Central Indian Ridge); Snake Pit, Lost City, and Rainbow (Mid-Atlantic Ridge); and Iheya (Okinawa Trough). Pair-wise comparisons of all microbial community data were accomplished using the software *MOTHUR* [1]. The results – shared community membership, richness, and structure estimators – reveal robust taxonomic groupings. Communities inhabiting inactive sulfides from geographically distant locations cluster together to the exclusion of other deep-sea substrates/settings. Distinct mineral substrates – sulfides versus basalts – host different communities at low-temperature in spite of close geographic proximity. At low-temperature, mineralogy is a dominant variable determining microbial community composition, reigning over geographic factors.

[1] Schloss *et al*. (2009) *Appl. Environ. Microbiol*. **75**, 7537–7541.

Alternation of cloud chemistry by dust particles

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Airborne dust has been found to alter cloud microphysics and precipitation, but few studies have investigated its effect on cloud chemistry. Dust particles can affect cloud chemistry by supplying transition metals that catalyzes heterogeneous reactions and by increasing cloud water pH values, which in turn controls effective rates of many aqueous phase reactions. This work combines dust emission model and inventory, regional chemical transport model (CTM), and a diagnostic chemistry tracking tool to study how dust particles alter chemical pathways of sulfur oxidization in cloud water. Clouds play an important role in the production of sulfate in the lower atmosphere. Modern CTMs generally predict that hydrogen peroxide (H_2O_2) is the dominant oxidant when cloud water pH remains low (< 4.5). When dust is loaded into clouds, however, it rapidly elevates cloud pH, and thus shifts the dominance towards ozone (O_3) or other pathways. We consider here the effects of both wind-blown dust and anthropogenic dust such as emitted from paved and unpaved road, agricultural operation, and construction. By tracking each chemical pathway with and without dust loading in the cloud, we examine how the presence of dust particles alters the relative importance of these oxidation pathways to sulfate production over barren land as well as agricultural and urban areas.