

## Geomicrobiology trends with depth across varied sites: Initial results from the CZNet GeoMicro Project

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The Critical Zone (CZ) is defined as the Earth's upper, dynamic skin, situated between the highest treetops and the lowest groundwater. Within the CZ, soil microbial communities perform a wide variety of biogeochemical functions, and can vary greatly between sites and with depth. The CZ Network Geomicrobiology (CZNet GeoMicro) project is investigating microbial community variability across 5 former CZ Observatories, including sites in tropical rainforest, Southeastern piedmont, Southwestern Desert, Northeastern steppe and Western mountains. Across sites we are sampling seasonally, down to 2 meters or refusal, investigating the connections between surface and deeper soils, and the influence of these connections on the biogeochemistry of these deep soils.

Initial analysis of the amplicon sequences showed that soil microbial communities in about half of the sites varied greatly with depth, while the others showed remarkable similarities, even down to 2 meters. In particular, the tropical soil samples from sites in the Luquillo rainforest were similar with depth, in contrast to other locations. While previous studies have seen important changes in overall microbial communities with depth, this research suggests that greater connectivity between the surface and depth drives reduced differences in microbial communities with depth. Further, this research strengthens evidence that microbial community composition is driven more by ecological setting than by variances of depth within soil profiles. Further research across this set of soil profiles can provide important insights into the environmental factors that drive the distinction between more connected and more variable profiles. The drivers of connectivity, including pore size, particle size, soil root density, and other factors, must be accounted for in studies that seek to examine how microbial communities are structured by depth.