The relationship between microbial community structure and C dynamics in a soil profile. (S03-fierer141907-Oral)

Authors:

- N.Fierer - *University of California, Santa Barbara, CA*
- J.P.Schimel - *University of California, Santa Barbara, CA*
- P.A.Holden - *University of California, Santa Barbara, CA*

Abstract:

Soil profiles are often many meters deep and may contain significant quantities of microbial biomass and organic carbon at depth. However, the majority of studies in soil microbiology focus exclusively on the surface soil horizons. As a result, we do not adequately understand how microbial community structure and carbon dynamics change with soil profile depth. We studied a 2 m deep profile located in an annual grassland near Santa Ynez, California, USA. Analysis of extracted phospholipid fatty acids show that microbial communities at depth are fundamentally distinct in composition from those at the surface; the proportional abundances of Gram-positive bacteria and actinomycetes generally increase with soil depth while the proportions of Gram-negative bacteria, fungi, and protozoa tend to decrease. These changes in microbial community structure parallel functional differences in microbial carbon processing. Microbial communities in the subsurface have lower carbon substrate use efficiencies and are more limited in their ability to mineralize a diverse array of carbon substrates. Respiration rates in subsurface horizons are more sensitive to temperature than the rates in surface horizons with Q10 values increasing with soil depth. Also, we find that the degree of nitrogen and phosphorous limitation to microbial respiration

increases with soil depth. Overall, our data suggest that an increase in temperature or the addition of nutrients to the soil profile is likely to have important implications for carbon sequestration in the subsurface.

Corresponding Author Information:

Noah Fierer
University of California, Santa Barbara
Dept. EEMB University of California
Santa Barbara, CA 93106
USA

phone: 8058935226
e-mail: fierer@lifesci.ucsb.edu

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