



MARTIN-LUTHER-UNIVERSITÄT
HALLE-WITTENBERG



Soil Science Colloquium - Halle

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Julius-Kühn-Hörsaal, Theodor-Lieser-Straße 9, Halle

Towards delineation of soil micro-environments and characterization of their microbial inhabitants

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Abstract:

The interactions between soil microorganisms and the micro-environmental conditions surrounding them are anticipated to define soil functioning and soil carbon cycling, yet the direct experimental evidence of such interactions is hard to come by, limiting success of process-based modeling and predictions. We explored microbial responses, i.e., bacterial community composition and metabolic pathways employed by the microbes, to the labile resource (i) in the soils of the same origin, texture, and mineralogy, yet after multiple years of contrasting vegetation history, and (ii) in the micro-environments of contrasting physical and hydraulic characteristics within these soils, as defined by small (4-10 μm \emptyset) and large (30-150 μm \emptyset) pores. We characterized soil pores and particulate organic matter in the soil using X-ray computed microtomography, while microorganisms actively assimilating the labile carbon (glucose) were identified using stable isotope probing. The study enabled us to delineate and characterize three broad soil microbial habitats, differing in nutrient availability and physical characteristics, and thus in composition, life and ecological strategies, and metabolic pathways of their microbial inhabitants. Namely, these are 1) large (30-150 μm \emptyset) pores within rhizosphere/detritosphere, 2) small (4-10 μm \emptyset) pores within rhizosphere/detritosphere, and 3) small pores in bulk (non rhizosphere/detritosphere) soil. The proposed micro-habitat concept is a first step towards a generalizable C processing classification of conditions within an intact, undisturbed soil matrix.