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Throughfall-mediated alterations to soil microbial community structure in a forest plot of homogenous soil texture, litter, and plant species composition

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Identifying spatiotemporal influences on soil microbial community (SMC) structure is critical to our understanding of patterns in biogeochemical cycling and related ecological services (e.g., plant community structure, water quality, response to environmental change). Since forest canopy structure alters the spatiotemporal patterning of precipitation water and solute supplies to soils (via "throughfall"), is it possible that changes in SMC structure could arise from modifications in canopy elements? Our study investigates this question by monitoring throughfall water and dissolved ion supply to soils beneath a continuum of canopy structure: from large gaps (0% cover), to bare Quercus virginiana Mill. (southern live oak) canopy (∼50-70%), to heavy Tillandsia usneoides L. (Spanish moss) canopy (>90% cover). Throughfall water supply diminished with increasing canopy cover, yet increased washoff/leaching of Na+, Cl-, PO43-, and SO42- from the canopy to the soils. Presence of T. usneoides diminished throughfall NO_3-, but enhanced NH4+, concentrations supplied to subcanopy soils. The mineral soil horizon (0-10 cm) sampled in triplicate from locations receiving throughfall water and solutes from canopy gaps, bare canopy, and T. usneoides-laden canopy significantly differed in soil chemistry parameters (pH, Ca2+, Mg2+, CEC). Polymerase Chain Reaction-Denaturant Gradient Gel Electrophoresis (PCR-DGGE) banding patterns beneath similar canopy covers (experiencing similar throughfall dynamics) also produced high similarities per ANalyses Of SIMilarity (ANO-SIM), and clustered together when analyzed by Nonmetric Multidimensional Scaling (NMDS). These results suggest that modifications of forest canopy structures are capable of affecting mineral-soil horizon SMC structure via throughfall when canopies' biomass distribution is highly heterogeneous. As SMC structure, in many instances, relates to functional diversity, we suggest that future research seek to identify functional diversity shifts (e.g., nitrogen transformation) in response to canopy structural alterations of throughfall water/solute concentration