

Horizon-specific bacterial community structure in the Sunjia Red Soil Critical Zone

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The Earth's Critical Zone can be tens of meters deep, but with the majority of regolith microbiology studies focusing exclusively on the topsoil, very little about the nature of the bacterial communities inhabiting the deeper zone. We investigated the shift of bacterial communities across the whole regolith developed from Quaternary red clay underlain by Cretaceous sandstone bedrock in subtropical China using drilling and 16S rRNA gene-based high-throughput sequencing. Bacterial species richness showed linear decrease at shallow layer (0–2 m) and turned to linear increase at deep layer (> 2 m). The determinants on the depth pattern of the richness switched from the nutrient levels including dissolved organic carbon (DOC), total carbon (TC) and total nitrogen (TN) at the shallow layer to pH values and carbon to nitrogen ratio (C/N) at the deep and oligotrophic layer. Horizon differentiation of bacterial community structure was observed to coincide with the CZ architecture stratification. Environmental factors including pH, C/N, TN, DOC, TC and moisture were significantly correlated with the differentiation, which reflected the adaptation of bacterial community to pedogenesis environments.