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Soil microbial succession and changes of functional genes in response to climate change with latitude simulated by long-term soil transplant

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To understand soil microbial community stability and temporal turnover in response to climate change, a long-term soil transplant experiment was conducted in three agricultural experiment stations over large transects from a warm temperate zone (Fengqiu station in Central China) to a subtropical zone (Yingtan station in southern China) and a cold temperate zone (Hailun station in northern China). Annual soil samples were collected from these three stations from 2005 to 2011, and microbial communities were analyzed by sequencing microbial 16S rRNA gene amplicons using Illumina MiSeq technology. Our results revealed a distinctly differential pattern of microbial communities in both northward and southward transplantations, along with an increase in microbial richness with climate cooling and a corresponding decrease with climate warming. The microbial succession rate was estimated by the slopes (w values) of linear regression of a log-transformed microbial community similarity with time (time–decay relationship). Compared with the low turnover rate of microbial communities in situ ($w=0.046$, $p < 0.001$), the succession rate at the community level was significantly higher in the northward transplant ($w=0.058$, $p < 0.001$) and highest in the southward transplant ($w=0.094$, $p < 0.001$). Climate warming leads to a faster succession rate of microbial communities as well as lower species richness, and compositional changes compared to in situ and climate cooling, which may be related to the high metabolic rates and intense competition under higher temperature. This study provides new insights into the impacts of climate change on the fundamental temporal scaling of soil microbial communities and microbial phylogenetic biodiversity.

Biography

Yuting Liang has completed her PhD from Tsinghua University, China and Post-doctoral research from University of Oklahoma, USA. Focusing on the research area of the stabilizing mechanism of soil microbial diversity, she has published more than 30 papers in reputed journals, and has been authorized 3 invention patents. She has been selected as the member of Youth Innovation Promotion Association, Chinese Academy of Sciences, and “333 High Level Talent Training Project” in Jiangsu Province.

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