

Differential microbial assembly processes and co-occurrence networks in the soil-root continuum along an environmental gradient

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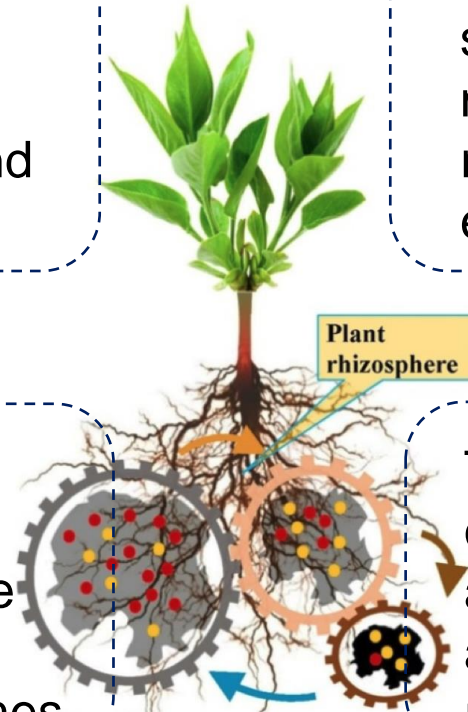
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Background

Soils harbor highly diverse microbial communities with numerous functions and provide a seed bank for root-associated (rhizosphere, rhizoplane and endosphere) microbiota

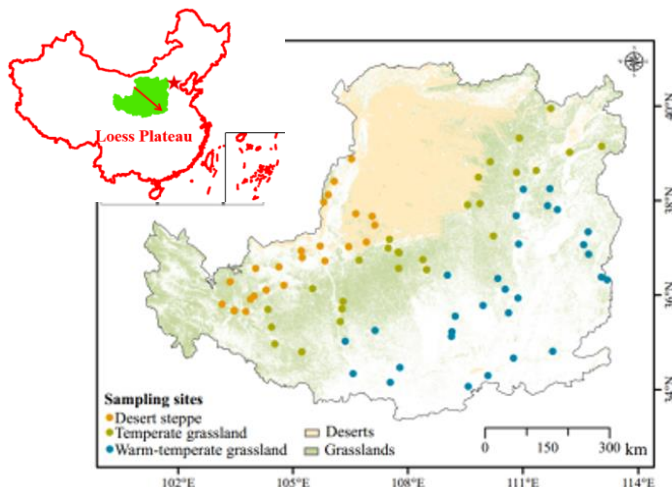
Different niche and life history strategies of soil and root-associated microbiota may result in different responses of microbial community to environmental factors.

Elucidating the factors that affect the relative proportion of stochastic versus deterministic processes would advance our understanding of community assembly in root-associated microbiomes.

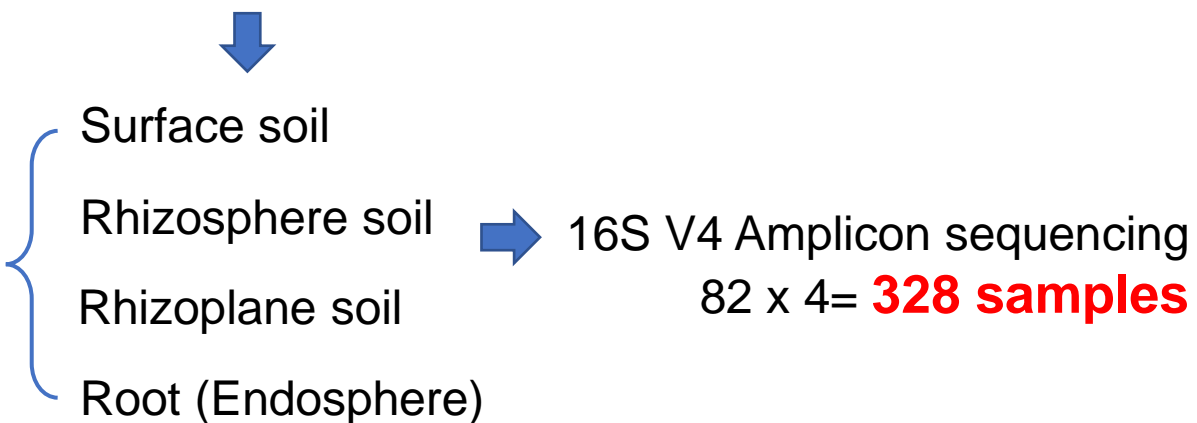
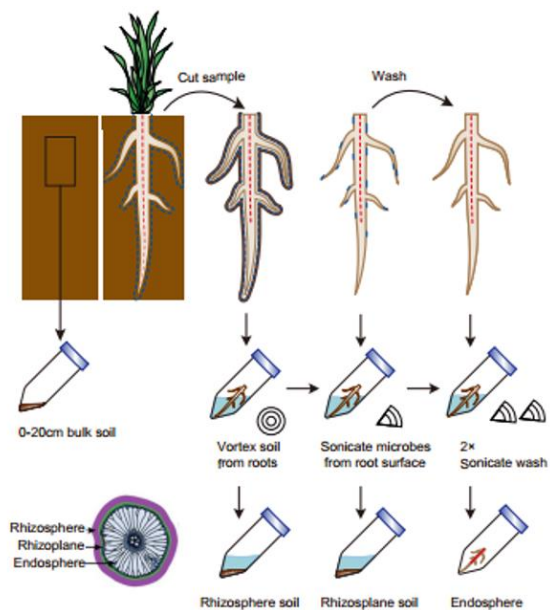
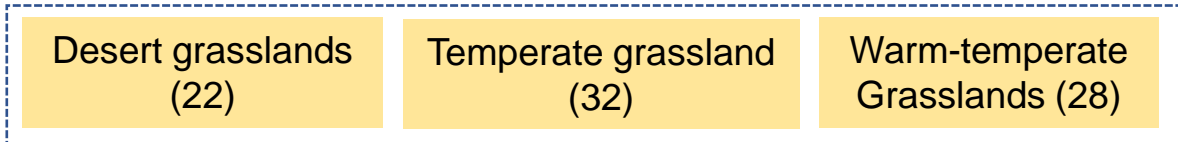


The degree to which microbial co-occurrence networks vary within and among root-associated microbiomes along environmental gradients *in situ* remains unclear.

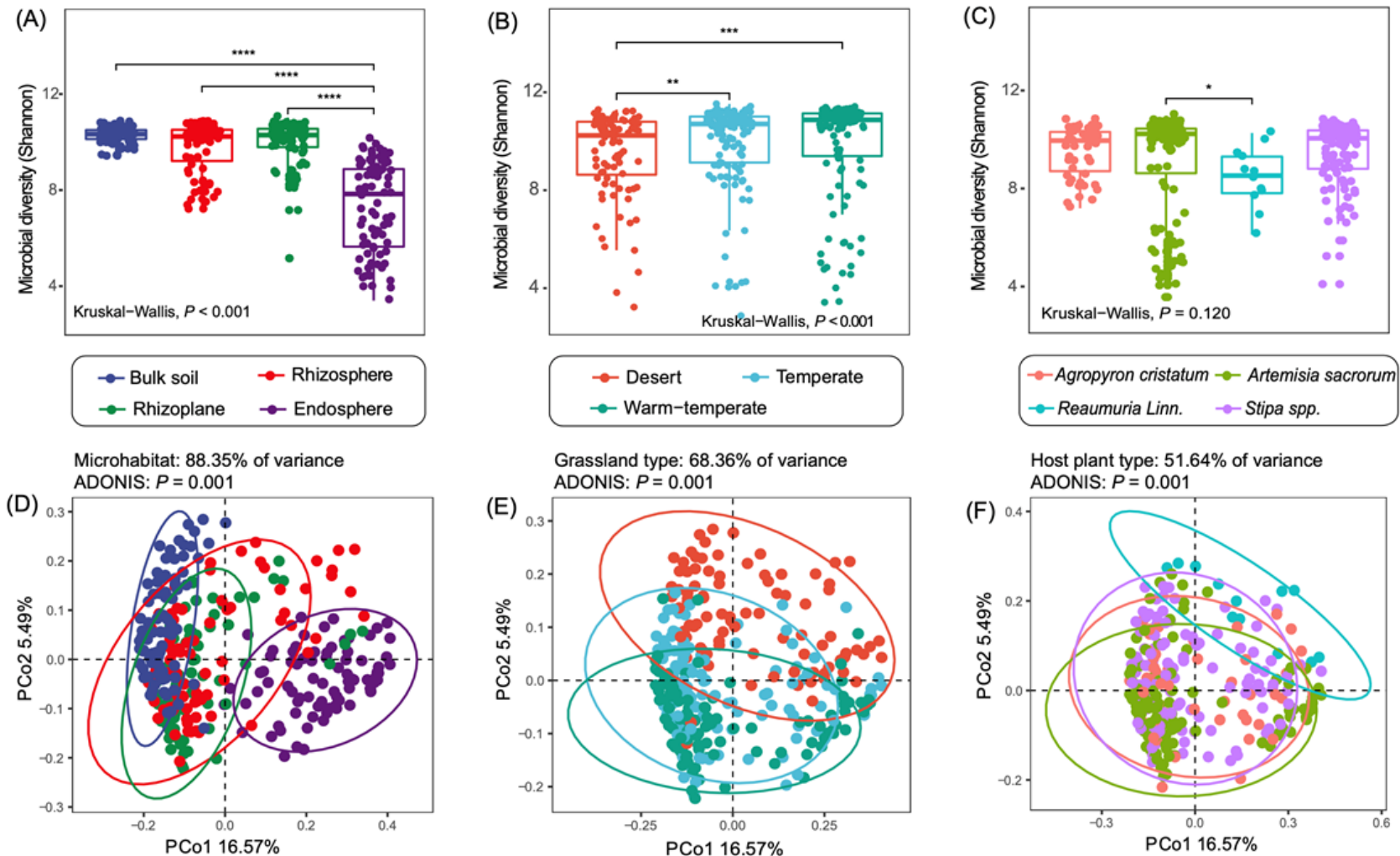
Experimental Design



82 field sites in Loess Plateau, China

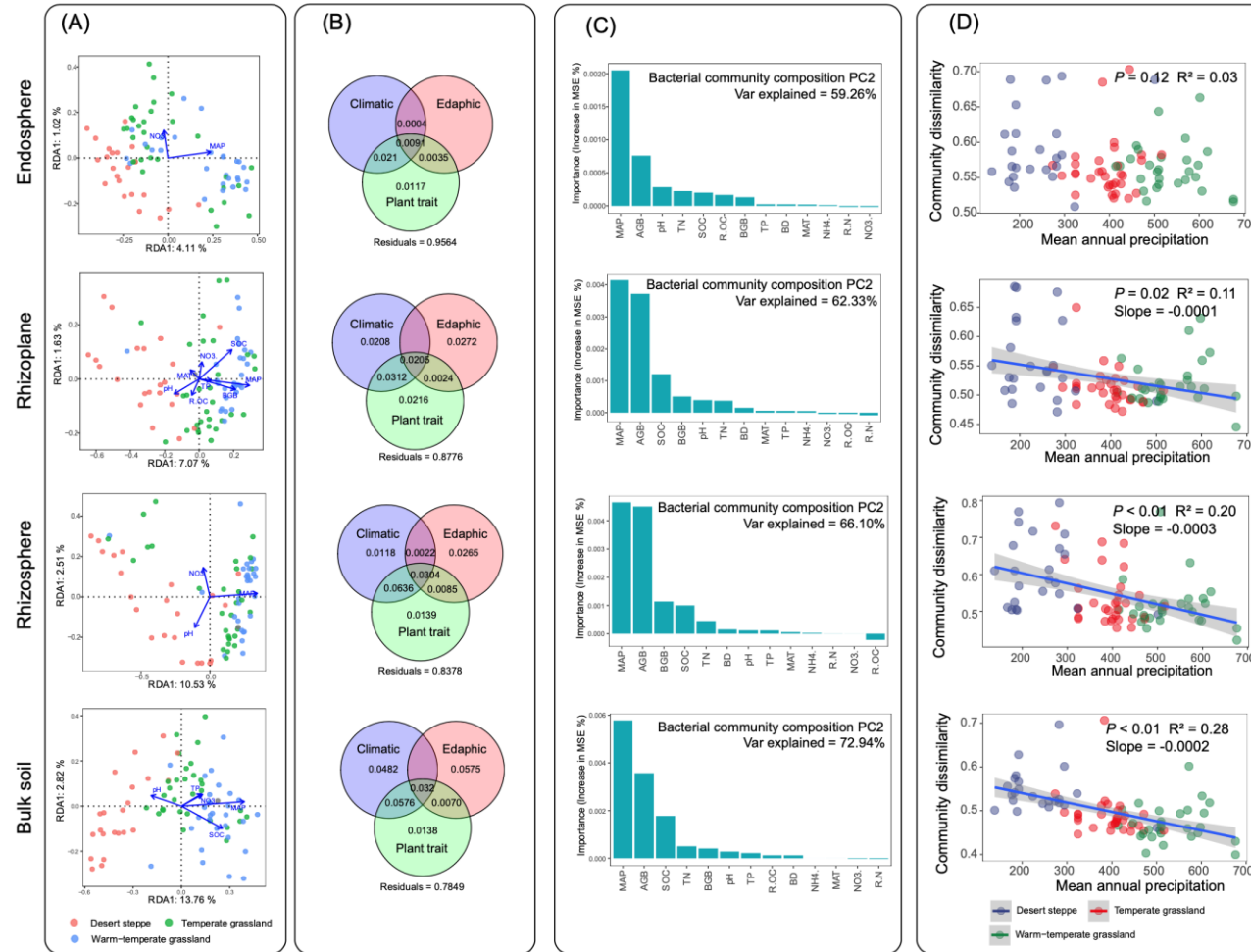


Diversity and community composition of microbes in the soil-root continuum along the environmental gradient



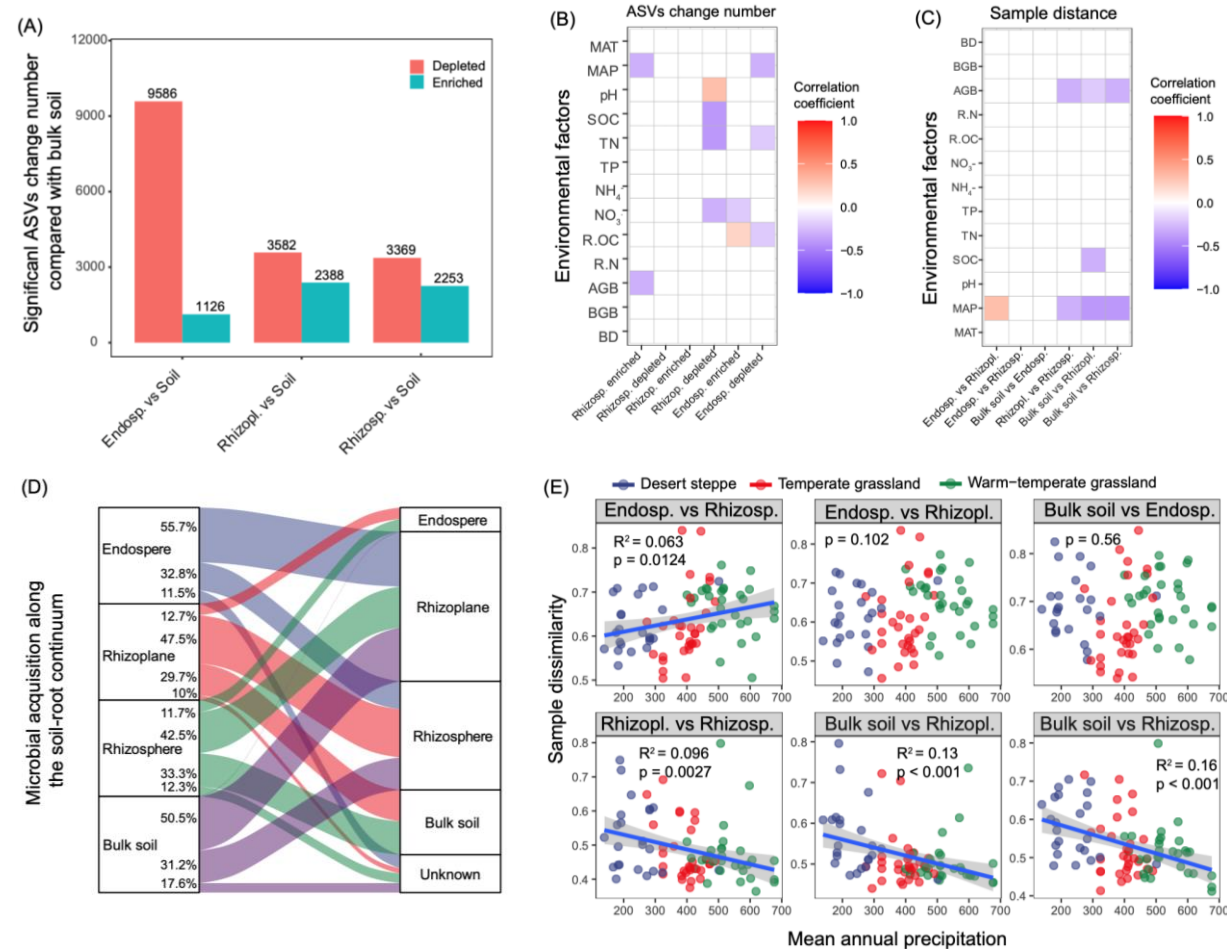
- Microhabitats, grassland type and plant species had significant effects on bacterial diversity and community composition, while microhabitats were the most important factors.

Relationships between the microbial community in the soil-root continuum and environmental factors



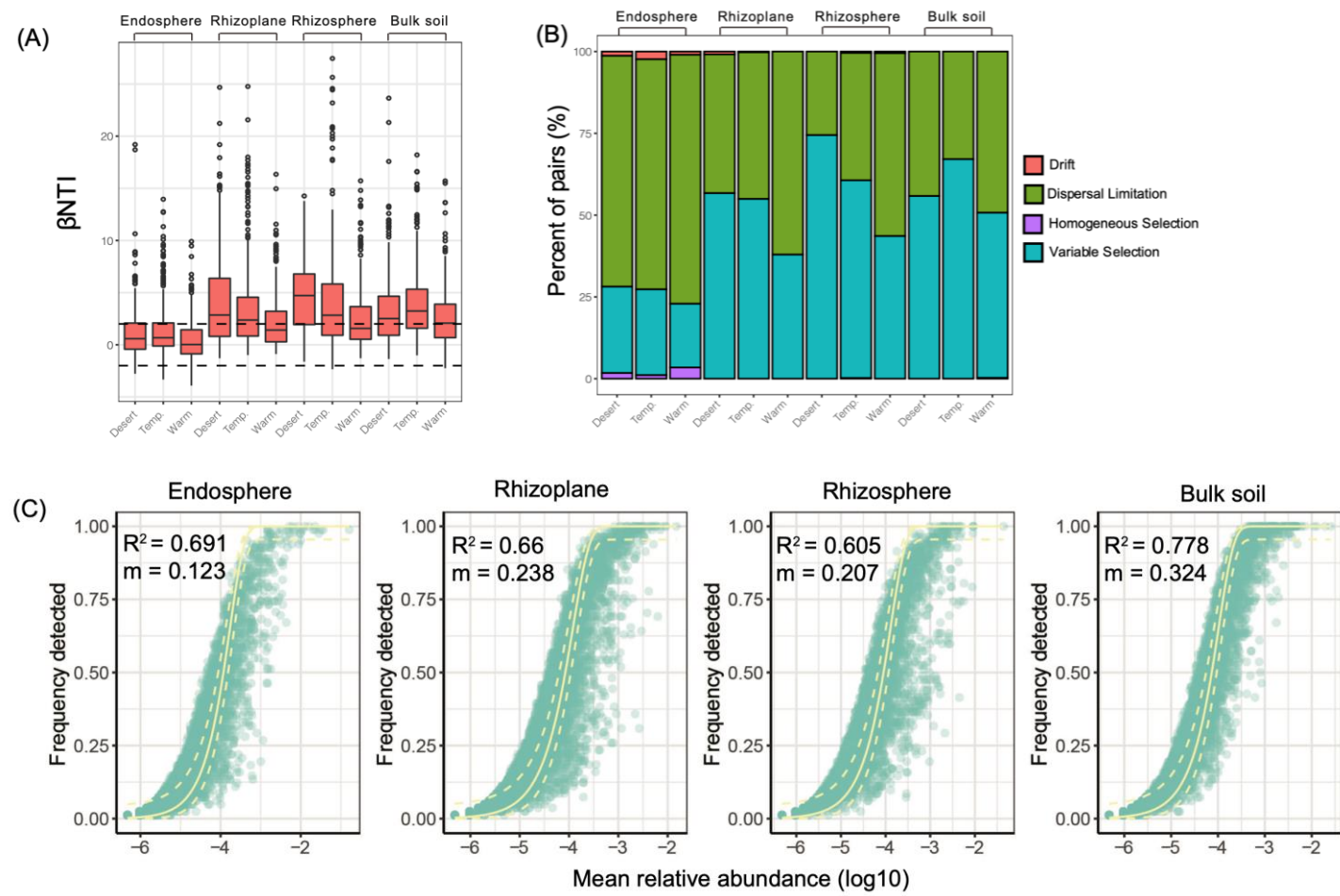
- MAP was the most important environmental factor to all parts of bacterial community along soil-root continuum

Microbial recruitment in the soil-root continuum along the environmental gradient



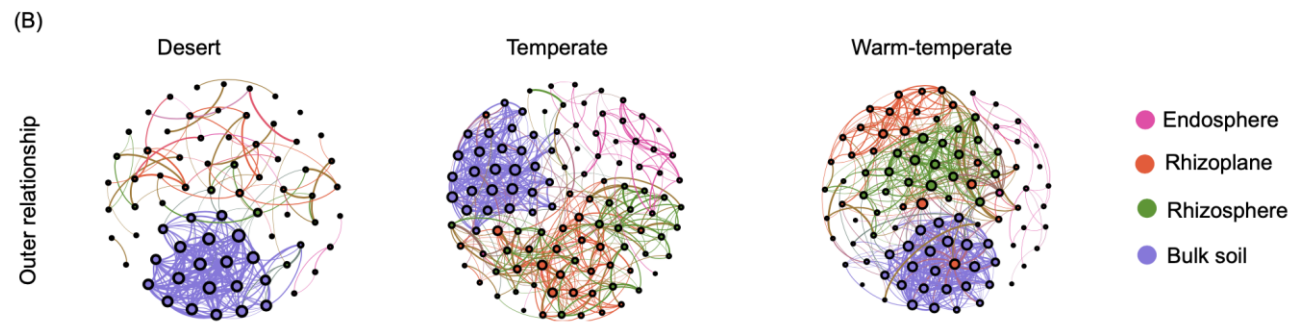
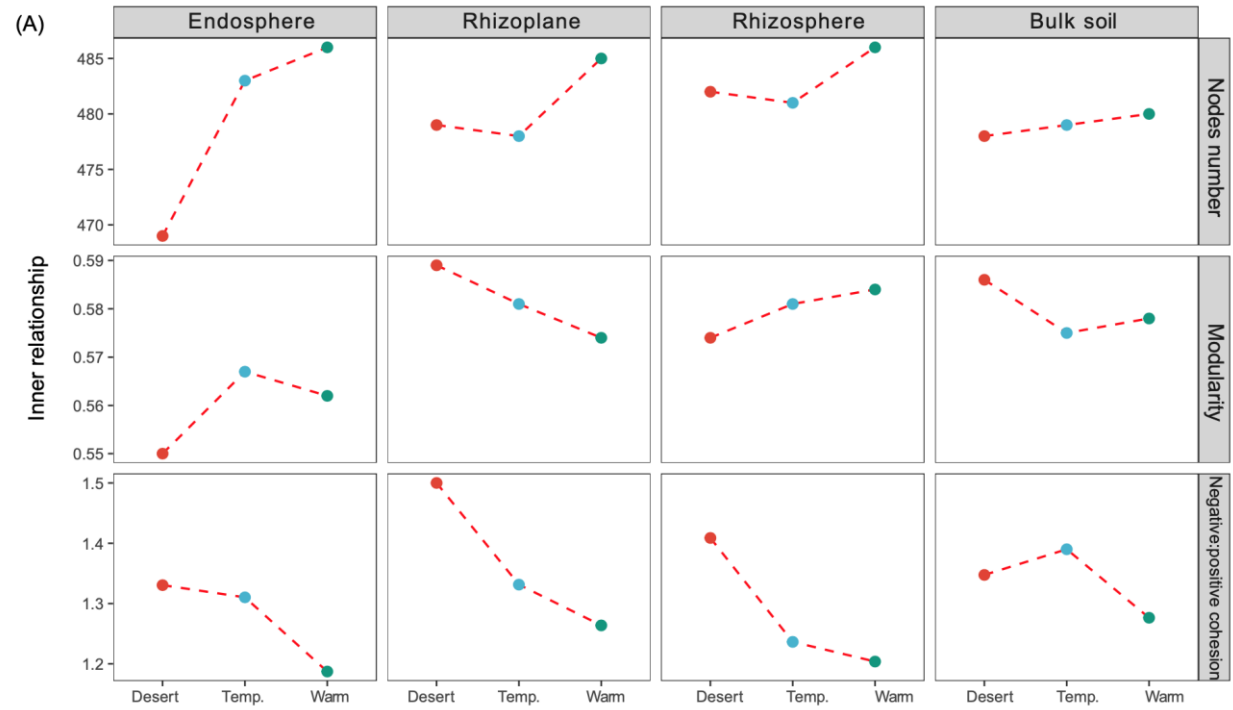
- With decreasing MAP, the root-associated bacterial community showed poorer connection with the soil but an increased connection with the endosphere bacterial community was observed.

Assembly mechanisms of microbial communities in the soil-root continuum along the environmental gradient



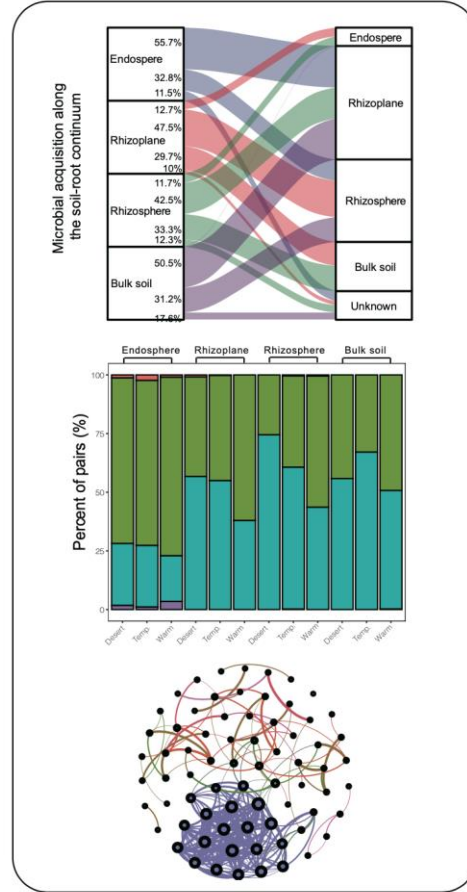
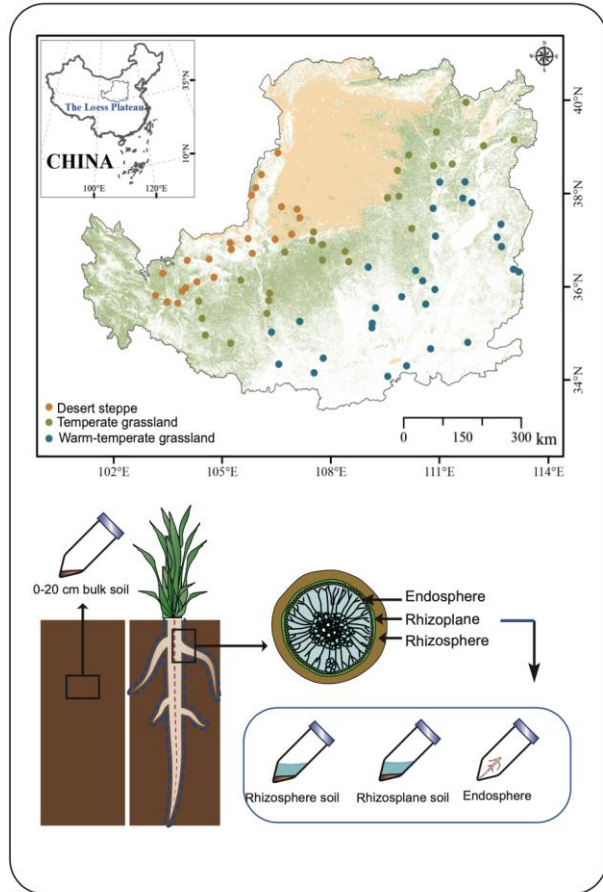
- Stochastic assembly processes were dominant in low-diversity communities of endosphere, and variable selection of deterministic processes were favored in soil, rhizosphere and rhizoplane microbiomes that had higher biodiversity.

Co-occurrence networks of microbial taxa in the soil-root continuum along the environmental gradient



- Co-occurrence networks of the soil and root-associated microbiomes did not destabilize at locations with higher environmental stress.

Summary



- Changes in microbes in the soil-root continuum along an environmental gradient were investigated
- The soil, rhizosphere and rhizoplane communities were governed by deterministic processes
- Environmental stress enlarged the dissimilarity of microbial communities in the soil-root continuum
- Root-associated microbiomes did not destabilize at locations with higher environmental stress

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