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Legacy of microbial composition matters in simulating climate-driven litter decomposition

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### Abstract Text:

The mechanisms underlying composition-functioning relationships have been a consistent area of inquiry in biogeochemistry since the 1950s. This question remains unresolved in soil microbiomes, though many approaches at varying scales have pointed to the same notion—composition matters. Confronting the methodological challenge arising from microbiomes' tremendous complexity, this study used the trait-based microbial model—**DEMENTpy**—to explore trait-based explanations for community-dependent microbial litter decomposition. We parameterized DEMENTpy for 5 sites representative of a climate gradient in Southern California, USA, and conducted reciprocal transplant simulations. The simulations demonstrated climate-dependent legacy effects of microbial communities on plant litter decomposition across the gradient. This result is consistent with an earlier field transplant study across the same gradient. An analysis of community-level traits further suggests that a 3-way tradeoff among resource acquisition, stress tolerance, and yield traits influences community assembly. Simulated litter decomposition can be consistently predicted with two community traits (indicative of two of the three strategies) plus local environment, regardless of the system state (transient versus equilibrium). If this unifying framework can be further confirmed by empirical studies, it means that community traits plus local environmental factors (e.g., environment and litter chemistry) may robustly predict litter decomposition across spatial-temporal scales. In conclusion, this study offers a potential trait-based explanation for climate-dependent community effects on litter decomposition with implications for improved understanding of whole-ecosystem functioning across scales.

### Session Selection:

**B049. Microbes in Biogeochemical Cycles: Linking Responses to Ecosystem Processes and Environmental Change**

### Submitter's E-mail Address:

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