The temperature sensitivity of soil: microbial biodiversity, growth, and carbon mineralization.

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Project Goals: Our overarching objective is to develop and apply 'omics approaches to investigate microbial community processes involved in nutrient cycling; interrogating community and taxon-specific microbial controls over key biogeochemical processes in terrestrial environments, testing quantitative ecological and biogeochemical principles using 'omics data, and including theories of element limitation of microbial growth, growth efficiency, and nutrient use efficiency. Our work will therefore "form and test hypotheses on underlying ecological principles", and "facilitate scaling of concepts and data across multiple levels of biological organization".

Abstract
Microorganisms drive soil carbon mineralization and changes in their activity with increased temperature could feed back to climate change. Variation in microbial biodiversity and the temperature sensitivities (Q_{10}) of individual taxa may explain differences in the Q_{10} of soil respiration, a possibility not previously examined due to methodological limitations. Here, we show phylogenetic and taxonomic variation in the Q_{10} of growth (5-35 °C) among soil bacteria from four sites, one from each of Arctic, boreal, temperate and tropical biomes. Differences in the temperature sensitivities of taxa and the taxonomic composition of communities determined community-assembled bacterial growth Q_{10} which was strongly predictive of soil respiration Q_{10} within and across biomes. Our results suggest community assembled traits of microbial taxa may enable enhanced prediction of carbon cycling feedbacks to climate change in ecosystems across the globe.

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