Review of: "The Role of Metabolic Strategies in Determining Microbial Community Diversity along Temperature Gradients"

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Potential competing interests: No potential competing interests to declare.

This study uses theoretical and mathematical modeling to explore the relationship between microbial diversity and temperature, a critical factor in ecosystem function. By combining ecological metabolic theory with a community assembly model, the researchers predict a unimodal (single peak) pattern in microbial diversity across temperature gradients. Empirical data from the Earth Microbiome Project aligns with these predictions. These insights suggest that temperature-dependent microbial diversity and carbon cycling can be anticipated through measurable life-history traits, providing a framework to understand microbial roles across diverse climates.

I found the work interesting and relevant to researchers in environmental microbiology. The approach is well-conceived and addresses a crucial topic in microbiology that has been explored in previous studies with divergent hypotheses.

While a general model to explain microbial diversity across temperature gradients is essential for advancing microbiological predictions, I wonder how robust this model remains when nutrient availability changes dramatically.

Another consideration is the representation of diverse microbial ecosystems in the Earth Microbiome Project (EMP) to ensure it can account for all microbial ecosystems. For example, can this model accurately predict microbial diversity in unique regions such as the South American Andes, where soils often contain high levels of organic matter? Additionally, how might altitude affect these predictions, given that temperature in the northern regions of South America is closely linked to altitude?