How do soil microbes exert impact on soil respiration and its temperature sensitivity?

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Abstract

Understanding how soil microorganisms influence the direction and magnitude of soil carbon feedback to global warming is vital to predict future climate change. Although microbial activities are major contributors to soil respiration (RS) and its temperature sensitivity (Q10), the mechanisms underpinning microbial influence on RS and Q10 remain unclear. In this study, structural equation modeling (SEM) was conducted to illustrate that bacteria mainly affect RS by shifting beta diversity (denoted NMDS ordinations) instead of richness. In contrast, Q10 values are governed by the richness and NMDS ordinations of bacteria. We also found that soil water content (SWC) was the factor key to changing bacterial properties ($P < 0.05$, R2 [?] 0.33). Network analysis demonstrated that only Proteobacteria were positively associated with RS ($P < 0.05$, $R > 0.5$). Illuminating the mechanisms underpinning the influence of soil microbes on RS and Q10 values is fundamental to understanding mechanistic soil-climate carbon cycles.

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Figure 1. Monthly variations in soil respiration rate and soil temperature.docx available at https://authorea.com/users/321235/articles/450497-how-do-soil-microbes-exert-impact-on-soil-respiration-and-its-temperature-sensitivity

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Figure 2. The relationship between soil respiration and soil temperature.docx available at https://authorea.com/users/321235/articles/450497-how-do-soil-microbes-exert-impact-on-soil-respiration-and-its-temperature-sensitivity

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Figure 3. Structural equation modeling (SEM).docx available at https://authorea.com/users/321235/articles/450497-how-do-soil-microbes-exert-impact-on-soil-respiration-and-its-temperature-sensitivity

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Figure 4. Regression analysis between selected variables.docx available at https://authorea.com/users/321235/articles/450497-how-do-soil-microbes-exert-impact-on-soil-respiration-and-its-temperature-sensitivity

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Figure 5. Co-occurring network of bacterial communities.docx available at https://authorea.com/users/321235/articles/450497-how-do-soil-microbes-exert-impact-on-soil-respiration-and-its-temperature-sensitivity

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Figure 6. Correlation network of bacterial communities.docx available at https://authorea.com/users/321235/articles/450497-how-do-soil-microbes-exert-impact-on-soil-respiration-and-its-temperature-sensitivity