Goldschmidt 2024 Abstract
https://doi.org/10.46427/gold2024.24285

Labile carbon additions stimulate specialist taxa and accelerate carbon cycling in peat catotelm

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Deep peatlands store vast quantities of sequestered carbon, but microbial decomposition is limited by energy availability and transport. Climate change, with increased root growth, may destabilize this vast store. Understanding microbial responses to changing plant inputs is crucial for predicting carbon release. In our study, we used 13C-labeled glucose to investigate deep peat carbon degradation mechanisms (>1 m). We found that adding labile carbon stimulates microbial activity, leading to the breakdown of older, more complex organic matter. This priming effect highlights a previously underappreciated vulnerability of deep peat carbon to changing environmental conditions. By identifying key microbial players and associated metabolites, this study offers novel molecular markers for predicting potential greenhouse gas emissions under various climate change scenarios. Overall, this multifaceted evidence supports deep peat carbon's inertness due to energy/transport limitations, but increased carbon inputs from climate change may destabilize this inert carbon, accelerating greenhouse gas emissions.