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Soil CO2 flux responses to experimental warming over time and space: The whole soil story

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Much of our understanding of the warming response of soil respiration (Rs) is derived from experiments that warm only the soil surface, potentially underestimating warming impacts on belowground processes and overestimating contributions from aboveground warming. Although many studies report increased Rs under warming when moisture is not limiting, estimates of temperature sensitivity vary widely across experiments.

The current analysis harnesses data from the Soil Warming to Depth Data Integration Effort (SWEDDIE) to assess the temperature sensitivity of Rs as a function of warming and soil moisture over time and depth across the contrasting climatic and ecosystem conditions of 16 deep soil warming experiments worldwide. We hypothesize that the seasonal pattern of soil CO2 fluxes may differ between warmed and ambient temperature plots, so we will first analyze the data from warmed and treatment plots separately, followed by a traditional synchronous comparison of CO2 fluxes between warmed and ambient plots.

Field warming studies provide a unique opportunity to observe the full complexity of the response of Rs responses to warming at an ecosystem scale, but disregarding warming impacts in biologically active deeper soil layers has the potential to create bias when interpreting the relative contributions of autotrophic and heterotrophic sources of Rs. This work is intended to address this potential bias as well as highlight potential limitations of assuming stationary or globally uniform Rs temperature responses.

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