New insights on carbon use efficiency using calorespirometry - a bioenergetics-based model



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We provide a framework to explain the observed variability in the calorespirometric ratio (CR) as a **Carbon-use efficiency** CUE = g (metabolic rates, growth function of metabolic rates, growth yields, and yields, substrate quality) substrate quality. This framework is used to estimate Calorespirometric ratio (CR) = $\frac{\sum R_{heat}}{\sum R_{CO_2}}$ carbon use efficiency (CUE) from observed CR. CR = f (metabolic rates, growth yields, substrate quality) R_{CO2} R_{heat} R_{CO2} R_{heat} Electron acceptors **Calorespirometry** is the simultaneous Controlled by measurement of heat production and environment conditions respiration rate from soils. and soil minerals R_a R_{CO_2} Mass Added Electron donors Controlled by land use Energy substrate Mass Biomass Mass Soil Enthalpy Enthalpy Increment micro-Partially Soil Mass oxidized Mass organisms organic Enthalpy organic Acknowledgments Enthalpy carbon Plant residues compounds Soil Organic carbon ---- Microorganism 2017-00932). A bioenergetics-based model

Microorganisms produce both CO_2 (R_{CO_2}) and heat (R_{α}) during decomposition of organic matter.

CUE = f(CR)

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