

Title: Seeking the best-fit microbial-relevant parameters via model calibrations: site-specific single dataset or cross-site multiple datasets?

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Project Abstract:

Soil organic carbon (SOC) is a significant component of the global carbon cycle, but model projections of SOC display large uncertainty in response to future climate change. Integrating microbial community dynamics into models potentially improves the accuracy of SOC projection, yet there are challenges on how to achieve the best-fit microbial parameters for various soil and ecosystem types. Based on a long-term (729 days) soil incubation dataset with soils collected from forest and grassland sites covering four soil orders, we obtained microbial parameters for the Microbial-ENzyme Decomposition (MEND) model using either single-case calibration (SCC) or by grouping the datasets according to soil type (i.e. multiple-case calibration or MCC). Additionally, we calibrate decay constants of a first-order model modified from the MEND using multiple-case dataset to compare behavior of traditional model with microbial model. The SCC calibration showed that model performance increased as more measurements were integrated into calibration. But combining measurements across other sites or ecosystems using MCC produced less satisfactory model performance compared to the SCC. First-order model also had worse performance when cases number increased. Our results indicate that parameterization of the MEND model is highly site-specific and microbial models may be more computationally- and data-intensive compared to traditional modeling approaches.