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Data-informed trait-based modelling of microbial carbon cycling in soil

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Soil microbial functional traits control carbon (C) decomposition and stabilization in soil. Integrating metabolic trade-offs and life-history strategies of microbial communities into models enhances the representation of feedbacks between microbial diversity and soil biogeochemical functions. This has great potential to improve our understanding of microbial C allocation and how microbial processes affect C storage and use efficiency in soil. The current challenge is, however, to quantify and identify ecologically meaningful microbial traits. This study utilizes data from a ^{13}C pulse-labelling litter decomposition experiment to inform a new soil C turnover model that captures microbial life-history traits and dormancy in combination with soil organic matter accessibility. Quantitative data from ^{13}C DNA stable isotope probing and high-throughput sequencing is used to parameterize the C utilization of copiotrophic and oligotrophic microorganisms. The new model is then applied to quantify C utilization of functional microbial groups and C turnover in soil. In scenario analyses we investigate the sensitivity of functional microbial groups and its feedback on C cycling to C input.