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Trait-based modeling of microbial carbon turnover in the rhizosphere

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Exudation of organic carbon triggers complex spatial and temporal patterns of biophysical and biochemical processes in the root-influenced soil (rhizosphere). We use process-based modeling as a tool to gain insights into microbial interactions and carbon cycling in the rhizosphere. Here, we present a trait-based rhizosphere model that accounts for two different functional microbial groups (copiotrophs, oligotrophs) that differ according to life-history strategies, microbial physiology (e.g., dormancy) and carbon turnover (small and large polymers). The model is calibrated and validated against experimental data from the literature. We apply a parameter search algorithm that identifies plausible parameter spaces by conditioning model outputs to parameter and process constraints that reflect current ecological knowledge. We show the general concept of the model, first simulations after model conditioning, and a concept for coupling the rhizosphere model with the structural-functional plant model CPlantBox to cover the whole-plant scale.