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# Uncertainty in the ROTHC model for carbon turnover in soil resulting from model initialization

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Knowledge on soil organic carbon (SOC) dynamics is essential for predicting the potential change in SOC in response to land use and climate change. When modeling the dynamics of organic carbon in soil, a common approach is to group all carbon compounds with similar decomposition rates into discrete carbon pools. However, a major drawback of these conceptual models is that the so-defined carbon pools are not measureable directly. The classical solution to this problem is "running the model to equilibrium". For that purpose, the ROTHC model is run for 10000 years assuming that land use and climatic conditions have remained unchanged during this time period, while the annual input of organic carbon and the size of the inert organic matter pool is iteratively adjusted to match the measured SOC and radio carbon values. In a first step, we used data from two long-term field experiments to illustrate the uncertainty that results from different scenarios of data availability on estimated parameters and resulting pool sizes. In this context, the effect of recent climate warming was also considered. In a second step, we numerically investigated the feasibility of estimating the pool sizes from an incubation experiment. This approach is appealing for two reasons. First, it is free of assumptions concerning land use history or climatic conditions in the past. Second, it also allows to simultaneously estimate the decomposition rates that are – like the pool sizes – not accessible to direct measurements.