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Effect of soil C model structural uncertainty on global projections

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In this study we apply the family of mathematical models for soil organic carbon (SOC) dynamics to estimate the effect of SOC model structural uncertainty on global scale C projections. The model family features switchable biological and physical mechanisms (such as explicit microbes, dynamic CUE and turnover, priming effect, dynamic adsorption strength and physical occlusion) in a single modeling framework where mechanisms can be turned on and off without affecting model parameters that are not involved in a given mechanism. The model family fit to experimental chronosequence data provided uncertainty ranges for mechanism-specific parameters and individual models likelihood.

Selected models were run with litter fall, soil surface temperature and moisture from Earth System Model (ESM) simulation as an input, while model parameters were randomly distributed according to their uncertainties. Variance of obtained model trajectories in a given time frame was assumed as a lower estimate for model prediction uncertainty. Different models in the family were compared by their prediction uncertainty in addition to their likelihoods to obtain the final estimate for efficiency of a certain model for ESM.