

Simulating mineral soil carbon changes with YASSO07 and YASSO15 models

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One of the main drivers in soil C loss or accumulation is SOC decomposition speed/turnover time, which is described by decomposition constants in model SOC pools. Model turn over time can be verified with delta 14C soil age. It has been successfully incorporated into different model testing or constraining their pools. It has been shown that the largest uncertainty lays with the slow SOC turnover pools where the bulk of SOC is accumulated.

We want to test the slowest pool in YASSO15 model - humus, which is critical in soil cycling. In the YASSO15 model, decomposition rates are prescribed to different forest litter fractions, which are described by their solubility in water, ethanol, acid and non-soluble. The decomposition rates of these fractions were measured in laboratory conditions by incubation. However, YASSO15 model uses one non-measurable pool – hummus, which is fed SOC from the non-soluble pool, but does not have feedback to it. Even small changes in the decomposition of this pool would result in large changes in the long term. Humus pool decomposition rate is especially important in the future SOC projections because it adds a large uncertainty to the projected values.

To compare previous model YASSO15 and a new layered version, we plan to use Bayesian calibration, which can provide uncertainty analysis of parameters and model predictions. After calibration, we can apply Bayesian model comparison and identify a model version that is the most plausible for forest modelling.