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The uncertainty of modeled soil carbon stock change for Finland

Aleksi Lehtonen (1) and Juha Heikkinen (1)

(1) Finnish Forest Research Institute, Vantaa, Finland (aleksi.lehtonen@metla.fi), (2) Finnish Forest Research Institute, Vantaa, Finland (juha.heikkinen@metla.fi)

Countries should report soil carbon stock changes of forests for Kyoto Protocol. Under Kyoto Protocol one can omit reporting of a carbon pool by verifying that the pool is not a source of carbon, which is especially tempting for the soil pool. However, verifying that soils of a nation are not a source of carbon in given year seems to be nearly impossible.
The Yasso07 model was parametrized against various decomposition data using MCMC method. Soil carbon change in Finland between 1972 and 2011 were simulated with Yasso07 model using litter input data derived from the National Forest Inventory (NFI) and fellings time series.
The uncertainties of biomass models, litter turnoverrates, NFI sampling and Yasso07 model were propagated with Monte Carlo simulations. Due to biomass estimation methods, uncertainties of various litter input sources (e.g. living trees, natural mortality and fellings) correlate strongly between each other. We show how original covariance matrices can be analytically combined and the amount of simulated components reduce greatly.

While doing simulations we found that proper handling correlations may be even more essential than accurate estimates of standard errors. As a preliminary results, from the analysis we found that both Southern- and Northern Finland were soil carbon sinks, coefficient of variations (CV) varying 10%-25% when model was driven with long term constant weather data. When we applied annual weather data, soils were both sinks and sources of carbon and CVs varied from 10%-90%. This implies that the success of soil carbon sink verification depends on the weather data applied with models. Due to this fact IPCC should provide clear guidance for the weather data applied with soil carbon models and also for soil carbon sink verification. In the UNFCCC reporting carbon sinks of forest biomass have been typically averaged for five years – similar period for soil model weather data would be logical.