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Modelling forest-soil carbon stocks at a national scale

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Evaluation of climate change consequences and national carbon reporting such as under the Kyoto protocol require long-term monitoring of carbon fluxes. We report on an ongoing project aimed at a national-level assessment of the terrestrial carbon sequestration potential under present conditions and under various climate and land use change scenarios, in particular in terms of their temperature effect. We develop empirical models for national soil carbon stock assessment and evaluate process-based soil carbon models for prediction of future carbon dynamics.

Based on soil profiles from 1057 locations within a national inventory network, we developed models linking soil carbon pools to variables such as site properties, soil type, tree species and age, and gridded values of precipitation, temperature, and nitrogen deposition. Model development was performed with various modelling approaches, such as stepwise regression, partial least squares, neural nets, Isomap and Support Vector Machines. The models were assessed in regard to the strength and significance of the relationships. More importantly, the models were investigated with regard to generalizability to areas with low data availability, e.g. the description of carbon in mountainous soils. We investigate the problems associated with upscaling the results to the national scale caused by the large degree of heterogeneity of Norwegian climate and landscape types.

In this way, we aim to understand the key factors that determine the distribution and size of forest soil C stocks in Norway. This understanding is a foundation for modelling of changes in forest soil C stocks under climate and land use change.