Geophysical Research Abstracts
Vol. 12, EGU2010-11107, 2010
EGU General Assembly 2010

Carbon stock changes in forest soils under warming

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Forests sequestrate atmospheric carbon in the tree biomass and, especially in the long term scale, in the form of soil organic matter. This ability might only be temporary, mainly as a result of an enhanced rate of soil decomposition processes caused by expected warming. The magnitude of possible carbon stock changes is still unknown.
Inventory data of the oxidizable carbon content in forest soils up to 30 cm depth (COX30) were used with the aim to predict the likely change of soil carbon content under warming. Sampling points (n=3930; one was representative for an area of 650 ha approximately) were located across all altitudinal zones and forest ecological series of the Czech Republic.
We specified the relation of soil carbon content and altitude described by site climatic conditions as a non-linear function and predicted the carbon losses in the forest soils for chosen climatic scenarios.
The mean value of the COX30 content in the forest soils of the Czech Republic was examined to be 62.6 $\pm$ 17.2 t ha-1. The COX30 content increases with altitude, at low altitudes negligibly, above 600 m a.s.l. rapidly, however, above 1050 m a.s.l., it decreases.
By means of the linear stochastic model created, different sensitivities of carbon release to warming was found according to different altitude levels. The biggest contributor to the total COX30 loss would be altitudes of 700 – 900 m a.s.l.
Using low, middle and high emission scenarios in climatic model HadCM3 (i.e. +1.38°C, +2.59°C and +4.24°C predicted temperature change), the losses in the Czech Republic, or in Central Europe eventually, are expected to be ca. 7.8%, 10.7% and 12.5%, respectively, of the present forest soil carbon stock. An additional temperature increase would cause further change of 2-3% maximally.