Geophysical Research Abstracts
Vol. 20, EGU2018-6953-1, 2018
EGU General Assembly 2018
© Author(s) 2018. CC Attribution 4.0 license.

Setting aside cultivated peatland does not mitigate CO_2 emissions as revealed by chamber and eddy covariance measurements

Katharina Meurer (1), Örjan Berglund (2), David Hadden (3), Achim Grelle (1), Thomas Kätterer (1), and Kerstin Berglund (2)

(1) Swedish University of Agricultural Sciences - SLU, Department of Ecology, Uppsala, Sweden (katharina.meurer@slu.se), (2) Swedish University of Agricultural Sciences - SLU, Department of Soil and Environment, Uppsala, Sweden, (3) Swedish University of Agricultural Sciences - SLU, Department of Forest Ecology and Management, Umeå, Sweden

Northern peatlands are important carbon (C) reservoirs and store about one third of the global terrestrial soil C pool. As a result of anthropogenic influence, i.e., drainage for agriculture and forestry, the usually high groundwater level decreases leading to peat aeration and, consequently, higher decomposition rates. This is particularly reflected in significant losses of CO_2, while fluxes of N_2O and CH_4 are generally considered of minor importance for the overall greenhouse gas (GHG) balance of cultivated peatlands in Scandinavia. Setting land aside from agricultural production has been proposed as a potential strategy to reduce GHG emissions from drained peatland, while restoring natural habitats on the abandoned land and additionally increasing C sequestration. However, the evidence for this is rather scarce.

In this study, we measured respiration by dark automatic chambers (AC), as well as CO_2, N_2O and CH_4 fluxes using manual static chambers on a cultivated and an adjacent set-aside peatland site in Central Sweden. We then compared theses chamber measurements with nighttime net exchange (NEE) measurements derived with the eddy covariance technique (Hadden & Grelle, Agric. For. Meteorol. 243, 1-8).

The set-aside site was found to be a stronger source for CO_2 emissions compared to the continuously cultivated site. However, higher N_2O fluxes and lower CH_4 uptake rates were observed on the cultivated site. It has further been shown that nighttime CO_2 fluxes by AC and EC show similar patterns, but that fluxes were on average lower according to EC than to AC measurements. CO_2 flux differences obtained by the two techniques varied depending on soil temperature and water filled pore space which varied more within the set-aside site, highlighting the reduced heterogeneity of the cultivated site.

We conclude that setting aside cultivated sites may not be an effective mitigation option for CO_2 emissions from drained peat soil. However, in order to give a full GHG balance, dissolved organic C losses and the emissions caused from producing an equivalent amount of agricultural commodities elsewhere have to be taken into account.