Geophysical Research Abstracts
Vol. 15, EGU2013-6926, 2013
EGU General Assembly 2013

Trace gas fluxes along soil carbon and drainage gradients at a peaty grassland

Katharina Leiber-Sauheitl, Roland Fuß, and Annette Freibauer
Johann Heinrich von Thünen Institute, Institute of Climate Smart Agriculture, Braunschweig, Germany
(katharina.leiber@ti.bund.de)

The importance of organic soils for the greenhouse gas (GHG) balance and the beneficial effect of CO_2 uptake by undisturbed peatlands are widely accepted. In contrast, it is known that after drainage peatlands become a large source of GHGs due to mineralization of organic material. Emissions decrease only when easily degradable substances are depleted and more stable substances accumulate. Therefore, subsequent to the first mineralization peak degraded peatlands are assumed to be a small source of GHGs. Based on GHG flux measurements along small-scale soil organic carbon and groundwater level gradients, we show that this assumption cannot be generalized.

The study area "Grosses Moor" (Gifhorn, Germany) is located within a former peat bog, which has been altered by drainage and peat cutting and is currently grassland under extensive agricultural use. The peat is amorphous and highly degraded. The focus of our study is on the acquisition of CO_2, CH4 and N2O fluxes at six measurement sites via manual closed chambers. The effects of small-scale soil organic carbon and groundwater level gradients on the GHG fluxes (CO_2, CH4, and N2O) are quantified. In order to calculate the annual CO_2 exchange rate, values are modeled on a 0.5 hour scale between measurement campaigns. The model is based on meteorological parameters, such as the photosynthetic active radiation and soil temperature.

During the 2011/2012 campaign, CO_2 was the most important greenhouse gas. Emissions were dependent on water table level but not on soil carbon content. Positive annual balances occurred on all sites demonstrating that even highly degraded peaty soils are an important source of greenhouse gases.

This study gives valuable information on the GHG source function of degraded peaty soils. Thus, our study improves predictions of the reaction of peatland soils to changes of soil and climate conditions with respect to their GHG emissions.