Geophysical Research Abstracts
Vol. 12, EGU2010-5469, 2010
EGU General Assembly 2010

Evaluating the applicability of the ECOSSE model to predict GHG emissions from managed organic soils in Brandenburg, Germany

Daniela Franz (1), Pia Gottschalk (2), Michael Giebels (3), Mark Richards (2), Jagadeesh Yeluripati (2), and Jo Smith (2)

(1) Institute of Geography, Faculty of Forest, Geo and Hydroscience, Technical University of Dresden, 01062 Dresden, Germany , (2) Institute of Biological and Environmental Sciences, School of Biological Sciences, University of Aberdeen, 23 St Machar Drive, Aberdeen, AB24 3UU, UK, (3) Institute of Landscape Matter Dynamics, Centre for Agricultural Landscape and Land Use Research (ZALF), Eberswalder Str. 84, 15374 Müncheberg, Germany

Greenhouse gas (GHG) balances associated with managed peatlands are not yet well understood. For instance, drainage of peatlands for agricultural use can cause a rise of CO2 and N2O fluxes whereas CH4 emissions decrease. A better understanding of the underlying processes will improve current estimates and predictions of GHG balances as well as soil carbon stocks under climate change. Furthermore, possible emission mitigating options for land-use may be identified. In Germany peatland represents four percent of the area and accounts for 2.3 to 4.5 percent of Germany's total GHG emissions, due to the fact that more than 95 % of German peatlands are currently managed or were cultivated in the past. To estimate and better understand GHG fluxes from peat soils soil organic matter (SOM) models can be employed. However, current state of the art SOM models do not account for specific peat soil conditions and very few modelling approaches specifically designed for organic soils have been developed as yet. We evaluate the applicability of a new SOM model - ECOSSE (Estimating Carbon in Organic Soils – Sequestration and Emissions). ECOSSE was constructed for peat soils in Scotland and Wales and developed from the SUNDIAL-model of carbon and nitrogen turnover in arable soils. The model is driven by commonly available meteorological data, soil parameters and management information. The main aim of ECOSSE is to predict the effect of land-use and climate change on GHG fluxes and therefore to assess the mitigation potential of C and N losses from organic soils by adapted land-use policy. We simulate GHG emissions for fen sites of the Rhin-Havelluch in Brandenburg, Germany, with different land-uses. Model results are evaluated against measured data of CH4 and N2O fluxes over three years, from 2007 to 2009. The measurements of these fluxes were obtained using the closed-chamber method and subsequent GC analysis within the project "Climate protection – fen-use-strategies" which was funded by the Federal Ministry for Education and Research of Germany. The area has been drained for agriculture since the beginning of the 18th century. Thus, the peaty soil is partially degraded and considered as a carbon source. The model was first tested at one site where reed canary grass (Phalaris arundinacea) was planted as a renewable energy source on a Hemic Rheic Histosol (WRB 2006) with 95 cm of peat thickness. In the past the soil was intensively tilled in the top 30 cm. Within the measurement period nitrogen fertilizer (70 kg N ha-1) was applied two times per year, both the number and time of harvests changed every year. Since the ECOSSE model was originally developed for annual arable crops, we parameterised the permanent land-use reed canary grass according to the scheme of already existing crops.