Geophysical Research Abstracts
Vol. 14, EGU2012-7442-1, 2012
EGU General Assembly 2012

Effect of experimental summer drought on greenhouse gas fluxes from soil under corn and sorghum

M. Deppe (1), R. Manderscheid (2), R. Well (1), H.-J. Weigel (2), and H. Flessa (1)

(1) Institute of Agricultural Climate Research, Johann Heinrich von Thünen-Institut, Federal Research Institute for Rural Areas, Forestry and Fisheries, Braunschweig, Germany, (2) Institute of Biodiversity, Johann Heinrich von Thünen-Institut, Federal Research Institute for Rural Areas, Forestry and Fisheries, Braunschweig, Germany

For most of Central Europe climate change is supposed to lead to higher frequencies of extreme weather events with hotter and drier summers. These changing climate conditions will affect vegetation and the water cycle. Water content is one of the most important parameters controlling production rates and fluxes of the greenhouse gases nitrous oxide (N_2O) and methane (CH_4) from soil. Drought periods directly affect water content in soil and thereby turnover rates of nitrogen and carbon; however, type and mass of plant coverage can modify the degree of desiccation.

We conducted measurements of greenhouse gas emissions (N_2O, CH_4 and CO_2) and nitrogen dynamics (nitrate and ammonium) on an experimental field site on loamy sand soil in Northern Germany. The site was installed to study the effect of summer drought on biomass production of sorghum compared to corn. During summer, plants on 'wet' plots were irrigated whereas on 'dry' plots rain was excluded by transparent rain shelters to obtain less than 40% of plant available soil water content.

Measurements were performed weekly over 1 $\frac{1}{2}$ years, including two periods of experimental drought. Soil water content and nitrogen dynamics were measured from soil samples and fluxes of N_2O, CH_4 and CO_2 were measured between plant rows using static chambers.

First results of greenhouse gas fluxes show increased uptake of methane in soil of 'dry' compared to 'wet' plots. No clear impact on N_2O emission could be identified until now, although N dynamics differed. Although corn growth was reduced to a greater extent than was sorghum growth under drought conditions, biomass production of corn was higher under both water regimes. Desiccation was higher and started earlier at 'dry corn' than at 'dry sorghum' plots in summer 2011, leading to lower CO_2 emission and higher CH_4 uptake in the drier soil.