Geophysical Research Abstracts
Vol. 18, EGU2016-17654, 2016
EGU General Assembly 2016

Modelling site-specific N2O emission factors from Austrian agricultural soils for targeted mitigation measures (NitroAustria)

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Results from a previous project “FarmClim” highlight that the IPCC default emission factor is not able to reflect region specific N2O emissions from Austrian arable soils. The methodology is limited in identifying hot spots and hot moments of N2O emissions. When estimations are based on default emission factors no recommendations can be given on optimisation measures that would lead to a reduction of soil N2O emissions. The better the knowledge is about Nitrogen and Carbon budgets in Austrian agricultural managed soils the better the situation can be reflected in the Austrian GHG emission inventory calculations. Therefore national and regionally modelled emission factors should improve the evidence for national deviation from the IPCC default emission factors and reduce the uncertainties. The overall aim of NitroAustria is to identify the drivers for N2O emissions on a regional basis taking different soil types, climate, and agricultural management into account.
We use the LandscapeDNDC model to update the N2O emission factors for N fertilizer and animal manure applied to soils. Key regions in Austria were selected and region specific N2O emissions calculated. The model runs at sub-daily time steps and uses data such as maximum and minimum air temperature, precipitation, radiation, and wind speed as meteorological drivers. Further input data are used to reflect agricultural management practices, e.g., planting/harvesting, tillage, fertilizer application, irrigation and information on soil and vegetation properties for site characterization and model initialization. While at site scale, arable management data (crop cultivation, rotations, timings etc.) is obtained by experimental data from field trials or observations, at regional scale such data need to be generated using region specific proxy data such as land use and management statistics, crop cultivations and yields, crop rotations, fertilizer sales, manure resulting from livestock units etc.
The farming community can only profit from NitroAustria, if model developments and results are integrated into the national emission inventory. Trade-offs between different greenhouse gas emissions and other nitrogen losses have to be discussed. The derivation of suitable mitigation options by optimization of common and evaluation of potential management practices for current and future climatic conditions is crucial to minimize threats to the environment while ensuring the long-term productivity and sustainability of agro-ecosystems. From the results gained in NitroAustria we will be able to show potential environmental impacts and propose measures for a policy framework towards climate friendly farming.