Geophysical Research Abstracts
Vol. 18, EGU2016-13680, 2016
EGU General Assembly 2016

The influence of management on GHG fluxes over Central European grasslands

Lukas Hoertnagl (1), Michael Bahn (2), Nina Buchmann (1), Eugenio Dias-Pinez (3), Werner Eugster (1), Ralf Kiese (3), Katja Klumpp (4), Ladreiter-Knauss Thomas (2), Haiyan Lu (3), Georg Wohlfahrt (2), Matthias Zeeman (3), and Lutz Merbold (1)

(1) ETH Zürich, Institute of Agricultural Sciences, Department of Environmental Systems Science, Zürich, Switzerland (lukas.hoertnagl@usys.ethz.ch), (2) University of Innsbruck, Institute of Ecology, Innsbruck, Austria, (3) Karlsruhe Institute of Technology (KIT), Institute of Meteorology and Climate Research, Karlsruhe, Germany, (4) INRA, Grassland Ecosystem Research, Clermont-Ferrand, France

Central European grasslands are characterized by a wide range of different agricultural practices along an altitudinal and management gradient, reaching from low pastures and meadows up to high alpine grasslands above the tree line. In the future, the intensification of already available agricultural land as a consequence of increased demand for feed and food will play an important role because of the scarcity of unused, productive land. The land use intensity strongly affects the exchange of trace gases between the biosphere and atmosphere. Therefore, the greenhouse gas (GHG) reduction potential for different farming strategies needs to be quantified before effective greenhouse gas mitigation strategies can be introduced. Direct measurements of long-term grassland GHG exchange at ecosystem scale along altitudinal and management gradients can help in identifying key processes that lead to GHG emissions.

In this synthesis we investigated GHG fluxes with a focus on N2O and CH4 from 15 grassland sites, quantified by means of the eddy covariance or chamber technique. Grasslands were a source of N2O, with the exception of one abandoned site, while they were a source or small sink for CH4. The predictive power of soil temperature and water-filled pore space for N2O and CH4 flux patterns during snow-free time periods in-between management events was generally low but varied considerably across the year. However, setting fluxes in relation to classes of the two soil parameters revealed favorable conditions (‘sweet spots’) for N2O and CH4 emissions for some sites. In addition, fertilization had a clear impact on N2O and CH4 fluxes, with emission peaks on the day of fertilization or one day later. N2O-N emission factors at fertilized sites were found to be slightly higher than the IPCC Tier 1 approach, ranging between 1.31 and 1.53 %, depending on the gap-filling method to calculate yearly cumulative N2O emissions.