Geophysical Research Abstracts
Vol. 21, EGU2019-18322, 2019
EGU General Assembly 2019

Emissions of nitric and nitrous oxide from a pasture ecosystem measured by eddy covariance

Christof Ammann and Markus Jocher

Agroscope Research Station, Climate and Agriculture Group, Zuerich, Switzerland (christof.ammann@agroscope.admin.ch)

Nitric oxide (NO) and nitrous oxide (N2O) are both emitted from ecosystems as an intermediate or byproduct of nitrification and denitrification processes in the soil. In managed agricultural ecosystems these emissions are enhanced by nitrogen input through fertilization. While N2O directly acts as greenhouse gas, NO is a reactive air pollutant that has effects on ozone formation but also on nitrogen input to (semi-)natural ecosystems leading to indirect N2O emissions. Since the two gases have very different characteristics, their concentration and emission is usually measured by different techniques, and thus fully parallel measurements are rare. Previous measurements have commonly been performed with chamber methods, that have difficulties to determine average emissions under spatially heterogeneous conditions as met e.g. for pastures.

We performed simultaneous emission flux measurements of NO and N2O on a pasture field over an entire growing season using the eddy covariance (EC) method. Measured EC fluxes for NO may deviate from the soil NO emission due to fast chemical conversion to NO_2 (in the presence of O_3) below the measurement level. To investigate this effect, additional EC flux measurements for NO_2 and O_3 were performed during selected periods.

For NO and N2O mainly emission fluxes were observed for the managed pasture. Emission levels strongly depended on management operations and soil moisture conditions. The results showed a clear difference in the optimum soil moisture conditions (high for N2O, low for NO) for the emission of the two gases. Overall, the N2O emission of the pasture was higher than the NO emission partly due to the frequently high soil water content. Unlike for cut grassland (and crop fields), N2O emission from the pasture was not limited to fertilizer events but occurred throughout the warm season.