Geophysical Research Abstracts
Vol. 19, EGU2017-13989, 2017
EGU General Assembly 2017

Effects of interactive global changes on soil N-fluxes in managed grassland

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Climate projections for the next decades expect a significant increase in air temperature, atmospheric CO_2 concentrations and the frequency and intensity of extreme weather events. The impact of individual environmental factors (warming and elevated CO_2) on biogeochemical cycles of ecosystems is moderately well studied. However, the quantification of the impact of these combined environmental changes on N-cycling functions of ecosystems and their biogeochemical feedbacks to the climate system is still fraught with uncertainty, both in terms of magnitude and the interactions.

The aim of the present study is the evaluation of the response of warming, elevated CO_2 concentrations and their combined effect on N-gas emissions, microbial community structure and function in a managed grassland site. This project is implemented in a complex field experiment in a mountain region (Raumberg-Gumpenstein) and consists of a factorial approach. Individual and combined effects of air temperature (ambient, warming of 1.5 and 3˚C) and atmospheric CO_2-concentrations (ambient, +150 and +300 ppm) on N-pools and N-gas emissions is examined and related to soil microbial processes.

In order to achieve our objectives, soil was sampled in autumn 2016. Intact soil cores were incubated at constant temperature to analyze N_2O, NO_x and NH_3 emissions in a lab incubation experiment. Simultaneously, soil samples were taken to examine different N pools (DON, N_{mic}, NH_4^+ and NO_3^-). In addition the abundance of ammonia oxidizing bacteria and archaea (*amoA*) together with expression levels of involved N-cycling target genes (*nirK*, *nirS, norB* and *nosZ*) was evaluated.

Variation in N-fluxes was observed and will be discussed. This research provides new insights on microbial processes in response to factorial climate change effects, and will enable us to evaluate changes through non-linear and non-additive effects of multiple factors of climate change.