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Tagungsnummer
P64

Thema
Kommission III: Bodenbiologie und Bodenökologie

Bodenorganismen-Pflanzen Interaktionen

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Titel
^{15}N tracing to elucidate links between biodiversity and nitrogen cycling in a grassland experiment

Abstract
Nitrogen (N) cycling is a fundamental ecosystem function of high complexity because N undergoes many transformations in soil and vegetation. The effect of biodiversity loss on ecosystem functions in general, and on N cycling in particular, was studied in several manipulative field experiments. To generate a comprehensive view of the influence of species richness on all major N transformations, we conducted laboratory incubations, in which we added ^{15}N-labeled ammonium and nitrate to soil samples of the "Jena Experiment", a manipulative large scale, long-term biodiversity experiment in grassland. The experimental site is located in Jena, Germany. The design consists of 4 blocks and 82 plots with 1-60 species and 1-4 functional groups (grasses, legumes, small herbs, tall herbs). Approx. 400 g of field-fresh soil was sampled from each plot of one of the 4 blocks and divided into three aliquots of 100 g each. In order to trace N turnover, we amended the incubations (in triplicate) either with 15N-labelled (98 at%) ammonium, nitrate, or with a mixture of both. The samples were incubated for two months at 20°C. Soil solution was extracted 1, 2, 4, 9 and 16 days after ^{15}N application by percolating 100 mL of nutrient solution through each vessel. Concentrations of NH_4-N, NO_3-N and total N in the extracts were determined with colorimetric methods. The N-isotopic composition in nitrate was analyzed by isotope ratio mass spectrometry (IRMS) using the denitrifier method. Ammonium N isotope ratios were determined using the "hypobromite oxidation" method, in which ammonium-N is converted to nitrite followed by azide reaction to nitrous oxide and IRMS analysis. The results will be comprehensively evaluated in a quantitative context using the modelling approach of Müller et al. (2007) to determine the size of six N pools and the rates of nine N transformations. Links between N transformation rates, N-pool size and plant species richness will be verified with the help of ANOVA.

Literatur
Christoph, M., Rütting, T., Kattge, J., Laughlin, R.J. and Stevens, R.J. 2007. Estimation of parameters in complex 15N tracing models by Monte Carlo sampling. Soil Biology & Biochemistry 39:715-726.