



Tracing changes in N transformations in a permanent grassland under elevated atmospheric CO₂

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Long-term observations (> 14 years) within the Giessen Free Air Carbon dioxide Enrichment (Giessen FACE) study on permanent grassland showed that the carbon fertilization caused significant changes in the ecosystem nitrogen cycle. The goal of this study is to understand the long-term effects of elevated atmospheric CO₂ and carbon input on the soil N transformations and plant N uptake in the Giessen FACE study. A pulse labelling with ¹⁵N tracing of ¹⁵NH₄⁺ and ¹⁵NO₃⁻ was carried out in situ. Different fractions of soil organic matter (recalcitrant, labile SOM) and the various mineral N pools in the soil (NH₄⁺, NO₃⁻), simultaneous gross N transformation rates, N species dependent plant N uptake have been quantified. The quantification of the gross N transformations are based on the turnover of NH₄⁺, NO₃⁻ and shall illuminate the interaction between carbon fertilization and changes in nitrogen cycle in this grassland ecosystem. Under elevated atmospheric CO₂, results shortly after N fertilization differed from long-term results and are in line with the long-term trace gas record of the site. In particular the ammonia oxidation, the mineralisation-immobilisation turnover, as well as dissimilatory nitrate reduction to ammonia (DNRA) and N plant uptake were affected. To further elucidate the microbial dynamics, the microbial communities and in particular the activity of the denitrifiers were evaluated.