Geophysical Research Abstracts,
Vol. 11, EGU2009-12463, 2009
EGU General Assembly 2009

Changes in Microbial Nitrogen Transformation Processes along a Chronosequence in the Forefield of the Damma Glacier

S. Töwe (1), R. Brankatschk (2), K. Schauß (3), J. C. Munch (4), J. Zeyer (5), and M. Schloter (6)

(1) Chair of Soil Ecology , Technische Universität München, Germany (stefanie.toewe@helmholtz-muenchen.de), (2) Institute of Biogeochemistry and Pollutant Dynamics, Swiss Federal Institute of Technology, Zürich,Switzerland, (3) Institute of Soil Ecology, Helmholtz Zentrum München, Germany, (4) Chair of Soil Ecology , Technische Universität München, Germany, (5) Institute of Biogeochemistry and Pollutant Dynamics, Swiss Federal Institute of Technology, Zürich, Switzerland, (6) Institute of Soil Ecology, Helmholtz Zentrum München, Germany (schloter@helmholtz-muenchen.de)

Due to the retreat of glaciers, the development of initial soil ecosystems can nicely be observed. Especially in young ecosystems the nitrogen cycle plays a major role because nitrogen is an important factor for the functionality and development of biotic communities. Especially dinitrogen fixation plays an important role for the additional nitrogen input into the soil. Furthermore an optimal nitrogen turnover, including an efficient mineralization of organic nitrogen compounds and low denitrification rates are important for a sustainable development of vegetation.
The aim of this study was to characterize the N turnover mainly nitrogen fixation, nitrification, denitrification and mineralization on gene and enzyme levels at different development stages of the soil ecosystem. For this purpose soil samples were taken along a chronosequence (10, 50, 70, 120, and older than 1000 years) from the forefield of the Damma Glacier (Canton Uri, Switzerland). We determined potential enzyme activities of each of the four mentioned processes and measured by quantitative PCR the corresponding functional bacterial genes nifH (nitrogenase), amoA (ammonia monooxygenase of bacteria and archaea), nirK and nirS (nitrite reductases), nosZ (nitrous oxide reductase), npr (neutral metallopeptidase) and apr (alkaline metallopeptidase). Additionally, we investigated the concentrations of dissolved organic carbon (DOC), dissolved organic nitrogen (DON), nitrate (NO3-) and ammonium (NH4+) and quantified the microbial biomass carbon (Cmic).
First results show an increase in potential nitrification and denitrification activities with increasing soil age which is confirmed by qPCR. However, gene abundances related to the biomass exhibit higher numbers of denitrifying and nitrifiying bacteria in young development stages than in the more developed soils. Especially nirS denitrifying bacteria and bacterial ammonia oxidizers seem to play a major role in young soil development stages. The measurement of ammonium and nitrate showed a strong increase after 120 years, while they were below detection limit in younger ecosystems.