Geophysical Research Abstracts
Vol. 16, EGU2014-16536, 2014
EGU General Assembly 2014
© Author(s) 2014. CC Attribution 3.0 License.

N cycling in soils and emission of nitrogen gases: how well do we understand the processes and their controls (Vladimir Ivanovich Vernadsky Medal Lecture)

Klaus Butterbach-Bahl (1,2), Elizabeth M. Baggs (3), Michael Dannenmann (1,4), and Ralf Kiese (1)

(1) Karlsruhe Institute of Technology, Institute for Meteorology and Climate Research, Atmospheric Environmental Research (IMK-IFU), Kreuzeckbahnstrasse 19, Garmisch-Partenkirchen 82467, Germany, (2) International Livestock Research Institute, Old Naivasha Road, Nairobi 00100, Kenya, (3) Institute of Biological and Environmental Sciences, University of Aberdeen, Zoology Building, Tillydrone Avenue, Aberdeen AB24 2TZ, UK, (4) Institute of Forest Botany and Tree Physiology, Chair of Tree Physiology, University of Freiburg, Georges- Koehler-Allee 53/54, Freiburg 79110, Germany

Although it is well established that soils are the dominating source for atmospheric nitrous oxide (N2O) and an important source for nitric oxide (NO), we are still struggling to fully understand the complexity of the underlying microbial production and consumption processes and the links to biotic (e.g. inter- and intraspecies competition, food webs, plant-microbe interaction) and abiotic (e.g. soil climate, physics and chemistry) factors. Recent work shows that a better understanding of the composition and diversity of the microbial community across a variety of soils in different climates and under different land use, as well as plant-microbe interactions in the rhizosphere, may provide a key to better understand the variability of N2O fluxes at the soil-atmosphere interface. Moreover, recent insights into the regulation of the reduction of N2O to dinitrogen (N2) have increased our understanding of BO and N2O exchange. This improved process understanding, building on the increased use of isotope tracing techniques and metagenomics, needs to go along with improvements in measurement techniques for N2O (and N2) emission in order to obtain robust field and laboratory datasets for different ecosystem types. Advances in both fields are currently used to improve process descriptions in biogeochemical models, which may eventually be used not only to test our current process understanding from the microsite to the field level, but also used as tools for up-scaling emissions to landscapes and regions and to explore feedbacks of soil N2O emissions to changes in environmental conditions, land management and land use.