DK+ Microbial Nitrogen Cycling
&
Wilhelm-Kühnelt
International lecture series

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"What we know and don't know about N-gas fluxes"

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DK+ Microbial Nitrogen Cycling
From Single Cells to Ecosystems

universität wien

"What we know and don't know about N-gas fluxes"

Although it is well established that soils are the dominating source for atmospheric nitrous oxide (N_2O), 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 N_2O, NO, NH_4 and N_2 fluxes at the soil–atmosphere interface. Moreover, recent insights into the regulation of the reduction of N_2O to dinitrogen (N_2) have increased our understanding of N_2O 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 N-gas 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 N-gas emissions to changes in environmental conditions, land management and land use.