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Influence of landscape factors on the net release rate of nitric oxide

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One of the most important sources of atmospheric nitric oxide (NO) are soils, which contribute approx. 30% ($\pm$ 20%) to the total global NO_X source. It is an ubiquitous soil characteristic that they produce and consume NO through microbial processes (mainly nitrification, but also denitrification). Meanwhile, it is state-of-the-art knowledge, that NO emissions from soils are macroscopically controlled by soil moisture, soil temperature and soil nutrient content, the so-called proximal influencing factors. However, proximal factors are influenced and/or controlled by so-called distal factors, i.e. landscape factors, like soil type, land use, vegetation cover, climate conditions, and more.

To investigate the relations between proximal and distal factors and the net NO release, we have taken soil samples from the "Hattenheim" catchment, some 20 km west of Mainz, Germany. The 10 km^2 catchment ranges between 80 and 620 m a.s.l. and comprises five different land use classes, namely crop fields, vineyards, grassland, deciduous forest, and mixed forest. In 2002 (October and December), as well as in 2003 (March, June, August, October) we have collected several hundreds of soil samples from these land use types (1-8 sampling plots per land use class), in order to address the seasonal variability of the selected soils. Accompanying measurements on all soil samples comprised contents of ammonium and nitrate, C/N ratio, loss of ignition, pH, and soil texture).

Sieved (2 or 4 mm) sub-samples of original composite soil samples (each consisting of at least 10 core samples taken from the top 5cm of the soil) were incubated in a 1 L cuvette in the laboratory. The soil containing cuvette was then used as a dynamic chamber to measure the net release rate of NO at 25˚C, covering the entire soil moisture range (0-100%) and two different headspace NO concentrations. From these laboratory studies, parameterization of the net NO release rate in terms of soil moisture was derived.

We will present NO net release rates from the 5 land use classes as function of time, proximal and distal factors. Special emphasis is given on the relationship between proximal factors and those parameters which determine the dependence of NO net release rates from soil moisture.