Nitric oxide emissions from different ecosystem types in a small catchment - Results from laboratory measurements

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During 2003 and 2004 a total of 100 soil surface samples (0-5 cm) has been taken from the "Hattenheimer Bach" catchment (50.1°N, 8.3°E; 80-600 m a.s.l.; 10 km^2). This catchment consists of different ecosystems, and is characterized by vineyards, croplands (cereals, rape), semi-natural grasslands, and forests (deciduous, coniferous, mixed) in a ratio 8:6:1:5 (area basis). All soil samples have been analyzed for soil chemical (NH_4^+, NO_3^-, pH, C/N ratio) and soil physical (texture, SOM, WHC) quantities by standard methods. Biogenic NO emission has been investigated on a total of 300 sub-samples (60 g, sieved to 2 mm). For that, sub-samples have been transferred into a laboratory soil fumigation dynamic chamber system. There, under controlled temperature conditions (25°C), NO release rates from the sub-samples (3 replications) have been determined in terms of (a) soil moisture (from dry to saturated) and (b) ambient (headspace) NO mixing ratios (< 1, 60, 150 ppb). Corresponding NO production and NO consumption rates were also quantified. For each ecosystem type, we will present our results in the form of max. NO release rates and those values which characterize the NO emission optimum curve (optimum, lower and upper limits of soil moisture). In case of the forest ecosystems, marked differences of NO release from the organic layer and mineral soil will specifically be addressed. With respect to catchment and ecosystem levels, we will discuss the role of the main controllers of NO emission and the potential of (prescribed) soil characteristics for the prediction of NO emissions.