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Soil biogenic NO emissions from a rare, nutrient-poor grassland ecosystem in Central Europe

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We continuously measured soil NO emission fluxes on the largest coherent nutrient poor steppe-like grassland ecosystem complex in Rhine Hessen (region of Rhineland-Palatinate, Germany) during an intensive observation period of 73 days (26 Sep to 1 Dec 2010). The measurements were part of the Finthenberg experiment which was conducted on the estate of the Mainz Finthen Airport (Mainz, Germany (49.969° N, 8.148° E)). The NO soil emission fluxes as well as NO_2 and O_3 deposition fluxes were determined using the dynamic chamber technique. Simultaneously, soil moisture, soil temperature and vertical profiles of NO, NO_2, O_3, CO_2, H_2O (seven inlet heights: 4, 13, 22, 75, 97, 167, 350 cm above ground level (a.g.l.)), vertical temperature and humidity profiles were measured. Additionally, eddy covariance flux measurements of O_3, CO_2 and H_2O (242 cm a.g.l.) were performed.

The proximity to the densely populated Rhine-Main-Area (location of measurement site: 9.5 km south-west of the Mainz city centre) requires a very careful data analysis regarding the particular wind directions. Two contrasting regimes were found. While freshly emitted anthropogenic NO (maximal mixing ratios of 95 ppb, with corresponding daytime O_3 levels sometimes as low as 2 ppb) caused non-stationary conditions during periods (hours to days) with north-eastern winds, situations with south-western winds were influenced by rather rural air masses (NO mixing ratios from 0.4 to 5 ppb).

We will present NO soil emission fluxes as well as NO_2 and O_3 deposition fluxes under different conditions and compare these results with fluxes determined using the aerodynamic gradient method. Required corrections for chemical reactions will be taken into account.