Geophysical Research Abstracts, Vol. 9, 02906, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-02906

Concentrations and fluxes of soluble reactive nitrogen compounds over an intensively managed grassland site

V. Wolff (1), I. Trebs (1), C. Ammann (2), C. Spierig (2), C. Flechard (2), A. Neftel (2), F. X. Meixner (1)

(1) Max Planck Institute for Chemistry, Biogeochemistry Department, Mainz, Germany, (2) Agroscope ART, Swiss Federal Research Station, Zürich, Switzerland (wolff@mpch-mainz.mpg.de)

Gradient measurements of soluble reactive nitrogen compounds were conducted at an intensively managed grassland site in Oensingen / Switzerland (47˚17'N, 07˚44'E) within the framework of the NitroEurope Integrated Project. NitroEurope aims to investigate the effect of the reactive nitrogen (N) supply on the direction and magnitude of net green house gas budgets for Europe. Oensingen was selected as a Super-site, where advanced measurements to quantify surface-atmosphere exchange fluxes are performed, N budgets and the interaction of N exchange with plant and soil processes are studied.

Mixing ratios of water-soluble species, such as HNO_2, HNO_3, $NH_3$and aerosol NH_4NO_3were measured using the Gradient Analyzer for Aerosols and Gases (GRAEGOR). The instrument is capable of collecting water-soluble gases and aerosol species (e.g., NH_4^+ and NO_3^-) simultaneously at two different heights by two rotating wet-annular denuders and two Steam-Jet Aerosol Collectors, respectively. The resulting aqueous solutions are analyzed on-line using ion chromatography for anions and flow injection analysis for ammonium (NH_4^+). Gradient Measurements were accompanied by meteorological measurements (e.g., radiation, relative humidity) as well as by profile and eddy covariance measurements of temperature and sensible heat to determine the turbulent diffusion coefficients.

Field measurements were conducted from 20 July until 4 September 2006. Meteorological conditions were characterized by (1) a dry and very hot period (T = 15 – 35˚C, RH below 60 % during daytime) at the end of July and the beginning of August and

(2) a cooler and wetter period (T = 10 – 25˚C, RH higher than 60 % during daytime) afterwards.

Mixing ratios of trace gases were significantly lower after rainfall events and during periods with reduced radiation. Mixing ratios of NH_3 decreased from maximal daytime levels of 8 – 17 ppb during the dry and very hot period to levels of 1 – 3 ppb during the cooler and wetter period. Maximal daytime HNO_3 mixing ratios were about 0.8 ppb during the hot period and dropped by a factor of two under conditions of reduced radiation. The diel course of aerosol NO_3^- mirrored that of its gaseous precursor HNO_3 with highest values (1 ppb) in the early morning hours. Based on these measurements, surface-atmosphere exchange fluxes will be estimated using the modified Bowen ratio method. The influence of chemical reaction timescales of the NH_3-HNO_3-NH_4NO_3 system on the assumption of the vertical constancy of exchange fluxes will be accounted for.