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Ozone deposition and soil nitric oxide flux measurements at a semiarid grassland in Hungarian Great Plain

L. Horváth (1), T. Weidinger (2), K. Pintér (3), Z. Nagy (1,3), Z. Istenes (4), R. Sáfár (2), and A.Z. Gyöngyösi (2)

(1) MTA-SZIE, Plant Ecological Research Group, Institute of Botany and Ecophysiology, Szent István University, Gödöllő, Hungary, (2) Department of Meteorology, Eötvös Loránd University, Budapest, Hungary, (3) Institute of Botany and Ecophysiology, Szent István University, Gödöllő, Hungary, (4) Faculty of Informatics, Eötvös Loránd University, Budapest, Hungary

Ozone deposition flux measurements using an Enviscope (Karlsruhe type) fast response ozone sensor combined with a CSAT3 sonic anemometer, and soil NO flux measurements using dynamic chambers (2 automatic and 2 manual) started in 2012 August, in the framework of the ECLAIRE and Animal Change EU 7th Integrated Projects. Concentrations of trace gases (NO, O_3) have been measured from 4 chambers by HORIBA gas monitors, sequentially. Meteorological data were collected using 30 minutes averaging time.

The raw 30 min ozone fluxes were determined based on the eddy-covariance technique [despiking, linear detrending, 2D coordinate rotation, time delay calculation for the maximization of the covariance, relationship between the signal of ozone sensor (mV) and the ozone concentration (ppb)]. Webb correction and different kind of spectral corrections were also applied. Quality control of the dataset was made i) based on the standard deviation of the ozone fluxes, ii) nonstationarity test of the fluxes and iii) the optimizing of time delay. If the time delay declined from the physically real values (1.8-2.3 s for 3 m long tubes) the half hourly data was deleted. Unrealistic time delay and high standard deviation of ozone fluxes were detected many times in stable stratification (nighttime). Raw ozone eddy-fluxes show characteristic daily and annual variations. For example mean values of ozone downward fluxes in daytime and nighttime in August 2012 were –150 ng·m^{-2}·s^{-1} and –30 ng·m^{-2}·s^{-1} while in December varied between –60 ng·m^{-2}·s^{-1} and –30 ng·m^{-2}·s^{-1}, respectively. The mean effect of the spectral correction in calculated fluxes is between 5-20%.

Mean nitric oxide fluxes with different soil chambers between August 2012 and March 2013 were 2.4-11.9 μgN·m^{-2}·h^{-1}, showing a strong correlation with soil temperature and large deviations among different chambers.

More detailed analysis of i) flux calculation methodology, ii) quality control and gap- filling methodology and iii) daily, seasonal and annual variation of soil NO fluxes, O_3 fluxes and deposition velocities are also presented.