



Eddy covariance flux measurements over a mixed deciduous forest in a moderately polluted environment: quantification of fluxes for the NO-NO₂-O₃ triad, CO₂ and H₂O

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In 2002 and 2003, two large-scale field experiments were conducted in a deciduous forest at Juelich (Germany) within the framework of AFO2000-ECHO (Emission and Chemical Transformation of biogenic volatile Organic compounds). With respect to the NO-NO₂-O₃ triad, CO₂ and H₂O, we have measured fluxes at the forest floor (dynamic chambers), above and in-canopy concentration profiles for the characterization of their diel evolution, and eddy covariance (EC) fluxes above the canopy for the quantification of their turbulent exchange at ecosystem level.

Our attention was devoted to the multi-scale processes controlling the fluxes of NO_x: biogenic soil NO emission and subsequent titration of emitted NO by O₃ within trunk and canopy spaces, leaf uptake of NO₂ within the crown area and the advection of polluted air masses to the site. From the contour plots of NO, NO₂ and O₃, which are derived from the temporal evolution of the vertical concentration profiles, one would suggest significant above canopy deposition of NO in the morning and enhanced deposition of O₃ in the late afternoon/evening. This is confronted with above-canopy fluxes of O₃, NO and NO₂ measured by the eddy covariance (EC) technique 4 m above the canopy top. EC-fluxes for CO₂ and H₂O will also be shown. Furthermore, profiles and EC-fluxes will be used to assess the capabilities and limitations of the EC-technique for reactive trace gases in a complex environment (see companion presentation by Kortner et al.), and to validate a detailed one-dimensional multilayer biosphere-atmosphere model for the coupled transport of CO₂ and H₂O (see companion presentation of Simon et al.).