3.143 Ozone deposition at a rainforest site (ATTO) in the central Amazon Basin.

Early Career Scientist

Presenting Author:
Stefan Wolff, Multiphase Chemistry and Air Chemistry Departments, Max Planck Institute for Chemistry – Mainz, Germany, stefan.wolff@mpic.de

Co-Authors:
Anywhere Tsokankunku, Multiphase Chemistry and Air Chemistry Departments, Max Planck Institute for Chemistry – Mainz, Germany
Christopher Pöhlker, Multiphase Chemistry and Air Chemistry Departments, Max Planck Institute for Chemistry – Mainz, Germany
David Walter, Multiphase Chemistry and Air Chemistry Departments, Max Planck Institute for Chemistry – Mainz, Germany
Jost Lavric, Max Planck Institute for Biogeochemistry – Jena, Germany
Florian Ditas, Multiphase Chemistry and Air Chemistry Departments, Max Planck Institute for Chemistry – Mainz, Germany
Pedro Assis, Instituto Nacional de Pesquisas da Amazônia/ INPA – Manaus, AM, Brazil
Giordane Martins, Instituto Nacional de Pesquisas da Amazônia/ INPA – Manaus, AM, Brazil
Antônio Manzi, Centro de Previsão de Tempo e Estudos Climáticos (CPTEC) – São José dos Campos, Brazil
Jonathan Williams, Multiphase Chemistry and Air Chemistry Departments, Max Planck Institute for Chemistry – Mainz, Germany
Nora Zannoni, Multiphase Chemistry and Air Chemistry Departments, Max Planck Institute for Chemistry – Mainz, Germany
Achim Edtbauer, Multiphase Chemistry and Air Chemistry Departments, Max Planck Institute for Chemistry – Mainz, Germany
Eva Pfannerstill, Multiphase Chemistry and Air Chemistry Departments, Max Planck Institute for Chemistry – Mainz, Germany
Ana Maria Yañez-Serrano, Institute of Ecosystem Physiology, Department of Forest Science, Albert-Ludwigs-Universität Freiburg, 79110 Freiburg, Germany
Rodrigo Souza, Escola Superior de Tecnologia, Universidade do Estado do Amazonas (UEA), Manaus, AM, Brazil
Ivonne Trebs, Luxembourg Institute of Science and Technology, Environmental Research and Innovation (ERIN) Department, L-4422 Belvaux, Luxembourg
Matthias Sörgel, Multiphase Chemistry and Air Chemistry Departments, Max Planck Institute for Chemistry – Mainz, Germany

Abstract:

Several recent papers have highlighted the importance of ozone (O_3) dry deposition estimates for modelling global O_3, especially over tropical forests. O_3 levels are expected to increase with ongoing deforestation: first, through release of O_3 precursors (NOx) from biomass burning and secondly by reduced deposition as forest canopies (esp. tropical forest) efficiently remove O_3.
The ATTO (Amazon Tall Tower Observatory) site is located in the Central Amazon (02°08’38.8’’S, 58°59’59.5’’W), comprising a 325 meter and two 80 meter towers. The site is an ideal location to perform comprehensive long-term studies regarding forest-atmosphere interactions. The climate is characterized by a very rainy (350 mm in March) and a drier season (ca. 80 mm in September). During the wet season, the air quality shows almost pristine conditions, whereas strong pollution from regional scale biomass burning prevails in the drier season. Since 2012 vertical mixing ratio profiles of H_2O, CO_2 and O_3 have been continuously measured at multiple heights between 0.05 and meanwhile 325 meters. Ozone fluxes have been determined by means of gradient methods and eddy covariance.
Here we present O_3 deposition velocities from gradient and eddy covariance measurements with first results of a recent O_3 flux campaign aimed at disentangling the different O_3 deposition pathways. Fluxes were measured at two levels above and two levels within the canopy to address a) the chemical flux divergence above canopy, b) the total ecosystem flux and c) the partitioning of the flux between upper canopy and understory and soil fluxes. Based on parallel profile measurements of O_3 and NO_x the storage flux of O_3 and the loss by reaction of O_3 with NO will be calculated. The fluxes for the different canopy parts are analyzed by means of stomatal and non-stomatal fluxes based on estimates of stomatal conductance from water vapor fluxes and leaf-level measurements.