Geophysical Research Abstracts
Vol. 20, EGU2018-16367, 2018
EGU General Assembly 2018


# Biosphere-Atmosphere Interactions in the Remote Amazon – Deposition Processes of Pollutants in the Forest during different Meteorological Seasons between 2012 and 2017

Stefan Wolff (1), Anywhere Tsokankunku (1), Christopher Pöhlker (1), Jorge Saturno (1), David Walter (1), Jost Lavric (2), Florian Ditas (1), Tobias Könemann (1), Marta Sá (3), Otávio Acevedo (4), Pablo Oliveira (4), Laurens Ganzeveld (5), Ana Maria Yañez-Serrano (6), Alessandro Araújo (7), Rodrigo Souza (8), Ivonne Trebs (1,8), and Matthias Sörgel (1)

(1) Max Planck Institute for Chemistry, Mainz, Germany, (2) Max Planck Institute for Biogeochemistry, Jena, Germany, (3) Instituto Nacional de Pesquisas da Amazônia/ INPA, Manaus, AM, Brazil, (4) Departamento de Física, Universidade Federal de Santa Maria, Santa Maria, RS, Brazil, (5) Environmental Sciences Department, Wageningen UR, Wageningen, The Netherlands, (6) Institute of Ecosystem Physiology, Department of Forest Science, Albert-Ludwigs-Universität Freiburg, Freiburg, Germany, (7) Empresa Brasileira de Pesquisa Agropecuária (EMBRAPA), Belém, PA, Brazil, (8) now at: Luxembourg Institute of Science and Technology, Environmental Research and Innovation (ERIN) Department, Belvaux, Luxembourg

The Central Amazon rainforest is characterized by a wetter and a drier season, caused by different atmospheric circulation patterns (on average, 350 mm precipitation in March and [U+F07E]80 mm in September). The two seasons exhibit very different air quality conditions, varying between near pristine in March/April and frequently strongly polluted (biomass burning) between August and November. The Amazon Tall Tower Observatory (ATTO) site is equipped with several towers (325 m walkup, 80 m walkup, 80 m mast), enabling short and long-term studies on forest-atmosphere interactions. Since April 2012 vertical profiles of $H_2O$, $CO_2$ and $O_3$ mixing ratios are continuously measured between 0.05 m and 80 m within and above the forest.
Further quantities such as aerosol loads, black carbon, CO and during several intensive measurement campaigns also $NO_x$ were measured. In combination with back trajectories these long-term measurements help to quantify terrestrial sources and sinks of pollution in this part of the Amazon. To further study the exchange of compounds like $O_3$ and $NO_x$ for this forest ecosystem, fluxes and deposition velocities were derived for selected compounds. This was achieved applying the aerodynamic gradient method to infer $O_3$ and $NO_x$ -exchange fluxes. Eddy covariance measurements of $CO_2$ and $H_2O$ fluxes were used to infer the stomatal conductance to differentiate between stomatal and nonstomatal deposition pathways. Besides seasonal patterns, the Amazon region is strongly affected by inter-annual atmospheric variations due to El Niño and La Niña events leading to shifts in temperature and precipitation regimes. In 2015-16 the strongest El Niño within the last 60 years has taken place, followed by a moderate La Niña in 2017. Due to the continuous data record of almost six years, we can evaluate the effects of these different phenomena on air quality.
These inferred $O_3$ and $NO_x$ atmosphere-biosphere fluxes have been further evaluated regarding the role of the stomatal and non-stomatal deposition pathways as well as in-canopy chemical interactions using a multilayer canopy exchange modelling system.