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Chemical characterization of submicrometer organic aerosol particles from the Amazon rainforest with high-resolution mass spectrometry

Denis Leppla[1], Leslie Kremper[2], Nora Zannoni[2], Maria Praß[2], Florian Ditas[2], Bruna Holanda[2], Christopher Pöhlker[2], Jonathan Williams[2], Marta Sá[3], Stefan Wolff[2], Maria Christina Solci[4], and Thorsten Hoffmann[1]

[1]Chemistry Department, University of Mainz, Mainz, Germany (leppla@uni-mainz.de)
[2]Atmospheric Chemistry Department, Max Planck Institute for Chemistry, Mainz, Germany
[3]Instituto Nacional de Pesquisas da Amazônia/INPA, Manaus/AM, Brazil
[4]Universidade Estadual de Londrina, Londrina/PR, Brazil

The Amazon Rainforest is one of the most important pristine ecosystems for atmospheric chemistry and biodiversity. This region allows the study of organic aerosol particles as well as their nucleation into clouds. However, the rainforest is subject to constant change due to human influences. Thus, it is essential to acquire climate data of trace gases and aerosols over the next decades for a better understanding of the atmospheric oxidant cycle. Therefore, the research site Amazon Tall Tower Observatory (ATTO) was established in the central Amazon Basin to perform long-term measurements under almost natural conditions.

Biogenic emissions of volatile organic compounds (VOCs) mainly consist of isoprene and terpenes. They are responsible for the production of a large fraction of atmospheric particulate matter. Isoprene represents the largest source of non-methane VOCs in the atmosphere and is primarily emitted from vegetation. Its global emissions were estimated in the magnitude of about 500 □ 600 Tg per year. Originally, the isoprene photooxidation was not expected to contribute to the secondary organic aerosol (SOA) budget, due to the high volatility of resulting oxidation products. However, several studies have proven evidence for the importance of isoprene SOA formation. Based on the two double bonds, isoprene is highly reactive towards atmospheric oxidants like OH and NO radicals. The subsequent reactive uptake on acidic particles is strongly dependent on the NO concentration. Therefore, anthropogenic sources have a substantial impact on the isoprene photooxidation.

The chemical composition of atmospheric aerosols in the rainforest highly depends on the current season, since the Amazon basin exhibits huge variations of gaseous and particulate matter with clean air conditions during the wet season and polluted conditions during the dry season, due to biomass burning events. For a comprehensive statement, it is necessary to perform field measurements under both conditions to study the isoprene and terpene SOA contribution. For that reason, filter samples were collected at ATTO at different heights to analyze the aerosol

composition emitted both from local and regional sources.

High-resolution mass spectrometry combined with data mining techniques will help to link characteristic SOA compounds to certain climate conditions in order to get insights into the Amazon aerosol life cycle.