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**Properties and Mixing State of Refractory Black Carbon over the Amazon Basin.** BRUNA A. HOLANDA, Christopher Pöhlker, Henrique Barbosa, Joel Brito, Samara Carbone, Yafang Cheng, Florian Ditas, Jeannine Ditas, Thomas Klimach, Christoph Knote, Luiz Machado, Jing Ming, Daniel Moran-Zuloaga, Mira L. Pöhlker, Maria Prass, Jorge Saturno, Hang Su, David Walter, Qiaoqiao Wang, Paulo Artaxo, Ulrich Pöschl, Meinrat O. Andreae, *Max Planck Institute for Chemistry, Mainz, Germany*

Black carbon (BC) accounts for a significant fraction of the atmospheric aerosol burden and efficiently absorbs shortwave radiation with direct effects on the Earth's radiation budget[1]. Additionally, BC-containing particles can act as cloud condensation nuclei (CCN) and influence cloud microphysics (indirect effect), or even affect cloudiness when advected above the boundary layer (semi-direct effect). These effects can be amplified by internally mixing with other non-absorbing compounds. In recent times, the widespread burning of savanna vegetation and tropical forests in Africa and South America represents one of the major sources of BC to the atmosphere globally[1].

Here we present long-term measurements of BC particles at the Amazon Tall Tower Observatory (ATTO), located ~150 km northeast of Manaus, Brazil[2]. The research site is a unique platform for studying near-pristine atmospheric conditions in contrast to anthropogenic pollution. The characterization of BC particles is done using a Single Particle Soot Photometer (SP2) instrument that directly measures the mass of individual refractory BC particles (rBC), from which can be calculated their size and associated coatings. Furthermore, aircraft measurements during the ACRIDICON-CHUVA field campaign characterized rBC over large areas of the Amazon basin during the dry season of 2014[3], including direct observations of fresh biomass-burning (BB) plumes.

Aircraft measurements identified a pronounced gradient in regional rBC concentrations, typically increasing from northwestern (more pristine) to the southeastern (more influenced by regional fires) Amazon region. Moreover, most of the rBC is located in the lower 4 km of the atmosphere. In the upper troposphere (> 8 km), rBC concentrations were only a few nanograms per cubic meter, with exception of some outflow regions. In the Amazon, deep convection can be responsible for the updraft of rBC particles from the lower troposphere to higher altitudes, especially in regions heavily impacted by BB emissions. In addition to the local BB emissions, an extended pollution layer enriched in BC particles (up to 2 μg/m3, stp) was found at ~3.5 km altitude, transporting BB aerosol from Africa to the Amazon basin. Within the pollution layer, the rBC cores that have aged for at least 10 days during transatlantic transport, are larger than the ones observed in local fresh BB plumes.

In this study, we relied on vertically and spatially resolved rBC measurements to determine the microphysical properties of rBC particles over the Amazon according to the different emission sources and transport time. Moreover, using long-term observations at ATTO we try to investigate to what extent they affect aerosol cycling and, ultimately, regional climate in this complex ecosystem.

References

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