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Time Resolved Measurements of Primary Biogenic Aerosol Particles in Amazonia

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Biogenic aerosols are ubiquitous in the Earth's atmosphere and they influence atmospheric chemistry and physics, the biosphere, climate, and public health. They play an important role in the spread of biological organisms and reproductive materials, and they can cause or enhance human, animal, and plant diseases. Moreover, they influence the Earth's energy budget by scattering and absorbing radiation, and they can initiate the formation of clouds and precipitation as cloud condensation and ice nuclei. The composition, abundance, and origin of biogenic aerosol particles and components are, however, still not well understood and poorly quantified. Prominent examples of primary biogenic aerosol particles, which are directly emitted from the biosphere to the atmosphere, are pollen, bacteria, fungal spores, viruses, and fragments of animals and plants.

During the Amazonian Aerosol Characterization Experiment (AMAZE-08) a large number of aerosol and gas-phase measurements were taken on a remote site close to Manaus, Brazil, during a period of five weeks in February and March 2008. This presented study is focused on data from an ultraviolet aerodynamic particle sizer (UVAPS, TSI inc.) that has been deployed for the first time in Amazonia. In this instrument, particle counting and aerodynamic sizing over the range of 0.5-20 μm are complemented by the measurement of UV fluorescence at 355 nm (excitation) and 420-575 nm (emission), respectively. Fluorescence at these wavelengths is characteristic for reduced pyridine nucleotides (e.g., NAD(P)H) and for riboflavin, which are specific for living cells. Thus particles exhibiting fluorescence signals can be regarded as "viable aerosols" or "fluorescent bioparticles" (FBAP), and their concentration can be considered as lower limit for the actual abundance of primary biogenic aerosol particles. Data from the UVAPS were averaged over 5 minute time intervals. The presence of bioparticles in the observed size range has been confirmed by filter samples.

First data analyses show a pronounced peak of FBAP at diameters around 2-3 μm. In this size range the biogenic particle fraction was generally higher than 50%. Additionally, bursts of FBAP have been observed nearly every day just before sunrise. During these periods the coarse (super-micron) aerosol consisted almost completely out of fluorescent bioparticles.