Title:	Size distributions and temporal variations of biological aerosol particles in the Amazon rainforest characterized by microscopy and real-time UV-APS fluorescence techniques during AMAZE-08
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Abstract:	As a part of the AMAZE-08 campaign during the wet season in the rainforest of central Amazonia, an ultraviolet aerodynamic particle sizer (UV-APS) was operated for continuous measurements of fluorescent biological aerosol particles (FBAP). In the coarse particle size range (> 1 μm) the campaign median and quartiles of FBAP number and mass concentration were 7.3 × 104 m -3 (4.0-13.2 × 104 m-3) and 0.72 μg m -3 (0.42-1.19 μg m-3), respectively, accounting for 24% (11-41%) of total particle number and 47% (25-65%) of total particle mass. During the five-week campaign in February-March 2008 the concentration of coarse-mode Saharan dust particles was highly variable. In contrast, FBAP concentrations remained fairly constant over the course of weeks and had a consistent daily pattern, peaking several hours before sunrise, suggesting observed FBAP was dominated by nocturnal spore emission. This conclusion was supported by the consistent FBAP number size distribution peaking at 2.3 μm, also attributed to fungal spores and mixed biological particles by scanning electron microscopy (SEM), light microscopy and biochemical staining. A second primary biological aerosol particle (PBAP) mode between 0.5 and 1.0 μm was also observed by SEM, but exhibited little fluorescence and no true fungal staining. This mode may have consisted of single bacterial cells, brochosomes, various fragments of biological material, and small Chromalveolata (Chromista) spores. Particles liquid-coated with mixed organic-inorganic material constituted a large fraction of observations, and these coatings contained salts likely from primary biological origin. We provide key support for the suggestion that real-time laser-induce fluorescence (LIF) techniques using 355 nm excitation provide size-resolved concentrations of FBAP as a lower limit for the atmospheric abundance of biological particles in a pristine environment. We also show some limitations of using the instrument for ambient monitoring of weakly fluorescent particles < 2 μm. Our measurements confirm that primary biological particles, fungal spores in particular, are an important fraction of supermicron aerosol in the Amazon and that may contribute significantly to hydrological cycling, especially when coated by mixed inorganic material.
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