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Physical properties and concentration of aerosol particles over the Amazon tropical forest during background and biomass burning conditions

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Abstract. We investigated the size distribution, scattering and absorption properties of Amazonian aerosols and the optical thickness of the aerosol layer under the pristine background conditions typical of the wet season, as well as during the biomass-burning-influenced dry season. The measurements were made during two campaigns in 1999 as part of the European contribution to the Large-Scale Biosphere-Atmosphere Experiment in Amazonia (LBA-EUSTACH). In moving from the wet to the dry season, median particle numbers were observed to increase from values comparable to those of the remote marine boundary layer (~400 cm^{-3}) to values more commonly associated with urban smog (~4000 cm^{-3}), due to a massive injection of submicron smoke particles. Aerosol optical depths at 500 nm increased from 0.05 to 0.8 on average, reaching a value of 2 during the dry season. Scattering and absorption coefficients, measured at 550 nm, showed a concomitant increase from average values of 6.8 and 0.4 Mm^{-1} to values of 91 and 10 Mm^{-1}, respectively, corresponding to an estimated decrease in single-scattering albedo from ca. 0.97 to 0.91. The roughly tenfold increase in many of the measured parameters attests to the dramatic effect that extensive seasonal biomass burning (deforestation, pasture cleaning) is having on the composition and properties of aerosols over Amazonia. The potential exists for these changes to impact on regional and global climate through changes to the extinction of solar radiation as well as the alteration of cloud properties.

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