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# Effect of dry-season biomass burning on Amazon basin aerosol concentrations and optical properties, 1992–1994

B. N. Holben
A. Setzer
T. F. Eck
A. Pereira
I. Slutsker

Aerosol concentrations and properties have been derived from a network of ground-based Sun-sky radiometer measurements in Brazil's Amazon basin region since 1992. The measurements characterize the background aerosol environment and aerosol emissions from biomass burning at eight selected sites. The duration and frequency of the measurements provide the foundation of an aerosol climatology based on direct sun measurements of aerosol optical thickness and retrievals of size distribution from solar aureole measurements. The aerosol optical thickness measurements clearly illustrate that for sites located within regions of biomass burning the duration of smoke above background levels often exceeds 2 months and frequently at levels an order of magnitude above background. The aerosol optical thickness range during preburning conditions was 0.11 to 0.27 at 440 nm. Under these conditions, stratospheric aerosols from Pinarubo constituted a significant part of the signal in 1993 but were about 50% less in 1994. During the burning season, smoke elevated the aerosol optical thickness above 1.0 for seasonally averaged values measured at 440 nm at sites located in active source regions in Mato Grosso, Rondonia, and Tocantins states. The measurement sites are located in the cerrado and forest conversion areas. Analysis of the size distribution of the particles indicated that the increase in aerosol optical thickness was associated with an increase of an accumulation and coarse particle modes. The asymmetry factor “g”, computed from the phase function, showed considerable spectral dependence between the preburning and burning seasonal phases. The 1020-nm channel was reduced from 0.66 to ~0.53, while at 440 nm little seasonal phase variation was noted. Conditions of burning were sufficiently strong that the atmospheric conditions associated with the climatological definition of a dry season was subdivided into (1) preburning, (2) transition to burning, (3) burning, and (4) transition to wet season phases for most sites. Averages and frequency distributions were used to characterize each seasonal phase by site. Changes in total column water vapor amount, also retrieved from direct sun measurements, did not have an apparent effect on the optical properties of the aerosols.

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