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MONITORING OF TRACE ELEMENT CONCENTRATIONS IN AEROSOLS OF AMAZONIAN BURNINGS

P. Artaxo, M.A. Yamasoe and J.V. Martins

Universidade de São Paulo - Instituto de Física
C.P. 61548, 01000-000, São Paulo, SP, Brasil

During the months of August, September and October the Amazon atmosphere is strongly perturbed by high concentration of gases and aerosols formed in biomass burning. The fires in Amazonia and in central Brazil's savanna have effects on the global atmospheric composition and on the natural cycles of several nutrients in the forest area. In order to monitor effects of these emissions on the atmosphere three observation stations were installed during 1991 and 1992, at Serra do Navio (Amapá), Alta Floresta (Mato Grosso), and Cuiabá (Mato Grosso). Aerosol particles were collected using filter techniques (nuclepore), which separate particles in two sizes: fine particles with average diameter less than two micrometers, and coarse particles with typical diameters of larger than two and smaller than ten micrometers. The element concentrations were measured using the PIXE (Particle Induced X-Ray Emission) technique after irradiating the aerosol particles with a high energy proton beam (2.4 MeV), obtained by a nuclear accellerator installed at the Laboratory for the analysis of materials by ion beams. Some 20 elements are normally detected for the Amazonian particles: Al, Si, P, S, Cl, K, Ca, Ti, V, Cr, Mn, Fe, Ni, Cu, Zn, As, Zr, Rb, Sr, and Pb. The mass concentration of aerosols is measured gravimetrically. The elementary carbon concentration is determined using a reflectance technique. Particle mass concentrations of 700 ug/m^3 have been observed during the dry season at Cuiabá and Alta Floresta. During the rainy season the background concentrations are 20 ug/m^3. High concentrations have been observed for K, S, Si, Fe, P, Ca, and Zn. Graphitic carbon accounts for about 20% of the mass of the particles. Through different analyses it is possible to separate the burning emissions from the primary emissions of the forest. The high emissions of K, P, S, and Zn from biomass burning have the potential to modify the natural geochemical cycles of these elements, thus altering the essential nutrient fluxes that maintain the Amazon ecosystem. A significant fraction of the particles emitted by the burnings may play a role in producing condensation nuclei for the formation of clouds, with a potential to modify the natural mechanisms that control the precipitation characteristics of the region.