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Observations about chemical composition of aerosols in the Brazilian Amazon region - Case study: Biomass burning in the subequatorial Amazon region

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The study was carried out in two cities in the Brazilian Amazon region, Tangará da Serra (14 ° 37'10 "S, 57 º 29'09" W, 427 m asl), located in a transition area between the Amazon biome and the Cerrado and has the characteristics of urban area in Amazon region; and Alta Floresta (9 ° 52 '32 "S, 56 ° 5' 10" W, 283 m asl) situated in the extreme north of the state of Mato Grosso (MT), both in the subequatorial Amazon region. Tangara da Serra has the largest production of sugar cane in the subequatorial Amazon region. They are located 800 km from each other. These two regions are inserted in a region with typical cycles of drought and rain that alter air pollution levels, and lies in the dispersion path of the pollution plume resulting from burnings in the Brazilian Amazon and pollution emanating from neighboring countries. Both cities have wet tropical climate with two well defined seasons: rainy summer (November to May) and dry winter (June to October). During the dry winter, biomass burnings are frequent in these regions. In 2008, the Department of the Environment has banned fires in the period from July 15 to September 15 throughout the State.

In this study chemical characterization was performed for approximately 100 aerosol samples collected in each site during 2008. Fine and coarse aerosol samples collected in SFUs were analyzed by ion chromatography for determination of cations (Na+, K+, NH3+, Ca2+ and Mg2+), anions (SO42-, Cl- and NO_3-) and organic acids (acetate and formiate) and also measures of black carbon (BC) (Aethalometer).

The results showed that for both sites the average concentrations were quite similar for PM2.5 (16 μg/m3), PM10 (11 and 13 μg/m3) and black carbon (1.4 μg/m3 for PM2.5 and 1.6 μg/m3 for PM10). Sulfate was the predominant species in fine (45%) and coarse (26%) particles in both sites. The sulfate concentrations ranged from 0.01-1.92 μg/m3 in PM2.5 and 0.01-1.66 μg/m3 in PM10 in Tangará da Serra and 0.01-2.93 μg/m3 in PM2.5 and 0.01-0.55 μg/m3 in PM10 in Alta Floresta. The presence of high levels of sulfate is probably related to biomass burning. Although with fire control policies, it was observed that the concentrations of some marker species (PM2.5, BC, K+) increased two or more times by comparing the dry and rainy seasons. However, the averages of PM2.5, PM10, BC measured in this study were much lower than most other previous studies developed in the 90s. This indicates apparently that, although not as effective, control programs have generated some reduction in the levels of pollutants.