Particulate matter composition in São Paulo, Brazil: Influence of the transport of pollutants – 2014

Guilherme M. Pereira (PG)[1], Kimmo Teinila (PQ)[2], Risto Hillamo (PQ)[2], Célia Alves(PQ)[3], Pérola de C. Vasconcellos*(PQ)[1]

[1]University of São Paulo, Institute of Chemistry.
[2]Finnish Meteorological Institute, Air Quality Research.
[3]University of Aveiro, CESAM & Department of Environment.
perola@iq.usp.br

[1] Av. Prof. Lineu Prestes, 748, 05508-000, São Paulo – SP, Brazil.
[2] Sahaajanankatu 20E, Helsinki 00880, Finland.
[3] CESAM & Department of Environment, 3810-193, Aveiro, Portugal.

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Abstract

The chemical composition of urban aerosol collected in São Paulo was determined in order to identify the main sources affecting the air quality.

Introduction

Atmospheric aerosols play an important role in atmospheric chemistry and physics, climate and public health. Industrial processes, fuel combustion, construction and biomass burning aerosol transportation are major sources of contamination in São Paulo. Previous studies done in this site, the wind trajectories (HYSPLIT) and satellite-derived fire counts showed that biomass burning affected the particulate matter composition in the winter months[1].
The objective of this work is to determine the ambient concentrations of organic carbon (OC), elemental carbon (EC), biomass burning tracers (Levoglucosan – LEV, Mannosan – MAN and Galactosan – GAL) and water soluble ions in atmospheric aerosols.
The samples were collected with a Hi-Vol sampler in quartz fiber filters (24h). An intensive campaign (Int.C.) was done in July, 2014 ($PM_{2.5}$) and two extensive campaigns (Ext.C.) were done once a week during the year of 2014 ($PM_{2.5}$ and PM_{10}).
OC and EC were determined by thermal-optical analysis. The monosaccharides were extracted with deionized water and determined by high-performance anion-exchange chromatography coupled with a mass spectrometer. The water soluble ions were also extracted with deionized water, and determined by ion chromatography.

Results and Discussions

The monosaccharides, non-sea-salt potassium, OC and EC concentrations were higher in the intensive campaign (dry season). LEV/MAN ratios were similar to the observed in previous studies in chamber with sugarcane burning[2]. Backward trajectories showed the transport of aerosol from biomass burning regions to the site, mostly in the intensive campaign and hot spots are shown during the dry season (Figure 1). Sulfate and nitrate were the ions with higher concentrations in all campaigns; both related to vehicular emissions in urban areas.

Figure 1. Biomass burning tracers, ions, OC and EC average concentrations.

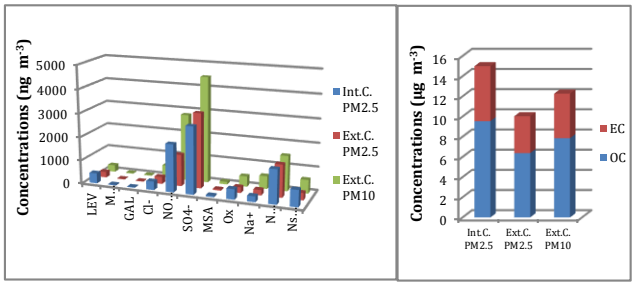
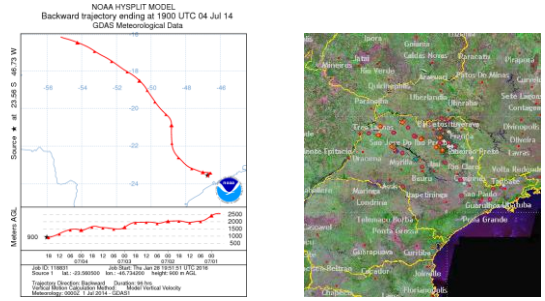


Figure 2. Backward air mass trajectory and fire map (NOAA) for July, 4th (intensive campaign).



Conclusions

In the intensive campaign higher concentration of biomass burning tracers and carbonaceous species were found; the backward air masses trajectories showed the transport of aerosol from sugarcane burning regions. Sulfate and nitrate presented higher concentrations. Besides biomass burning, vehicular emissions are the sources in urban areas.

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