Chemical Characteristics of Aerosols Inhaled by Population in Urban Areas of Colombia

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Abstract

This study presents the aerosol mass size distribution and size-segregated concentrations of carbonaceous material, metals and water-soluble ions in Bogota, capital city of Colombia and Palmira, an agro-industrial town impacted by a diversity of atmospheric emission sources, including both anthropogenic and biogenic emissions. PM samples were collected using a 9-stage non-viable Andersen Impactor, which simulates the particulate deposition in different fractions throughout the human respiratory system. The results show that the mass concentrations were higher in Bogota than in Palmira. The results of this study settled that 23 ±11.3 % of PM inhalable collected in Bogotá have a size smaller than 1.1 µm, which corresponding to the fraction of PM inhalable that can enter to the alveoli of people exposed of air pollution in the area studied. In case of samples collected in Palmira, this fraction corresponded to 13.8 ±1.9% of PM inhalable. Particles in Bogota had a different distribution of elemental carbon, Organic Carbon and water-soluble ions than Palmira. The relative abundance of some chemical components noticed during the no precipitations days in Bogotá, reveled the formation of secondary aerosols during this weather conditions. The increases of PM1.1 and PM2.1 concentrations during the no precipitation days could be associated to emissions derived from agriculture and open biomass burning, explained by the abundance of oxalate, potassium and ammonia ions. The percentage of PM breathily that can enter, deposit, and be retained in the nasal cilia, tracheobronchial tree, bronchioles, and alveoli was no significant different in Bogota than Palmira. The third part of breathable particles in Bogotá (29.9%) can reach and deposit in the alveoli and more than a half (60.1%) in the bronchioles and deeper parts of the human respiratory system. In Palmira, those percentages were slightly lower, 25% into alveoli and 58.8% into bronchioles and deeper parts.

Early Career Scientist

YES, I am an early career scientist.

IGAC Activities

GEIA: Global Emissions Initiative, MAP-AQ: Monitoring, Analysis and Prediction of Air Quality, BBURNED: Biomass Burning Uncertainty: ReactioNs, Emissions and Dynamics

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