Receptor modeling in the metropolitan region of Rio de Janeiro: What is the role of PAHs, n-alkenes, meteorological conditions on source apportionment of fine aerosol?

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Receptor models are increasingly being used to explain atmospheric environment results and evaluate the common characteristics of a particular region. The aim of this study was to investigate the chemical composition of fine aerosol ($PM_{2.5}$) as a function of its spatial distribution in Rio de Janeiro, Brazil, by PCA followed by a Multiple Linear Regression Analysis (PCA-MLRA). The data set comprehended from 6 sites with sources and socioeconomically activities distinct, such as: traffic, marine aerosol, industrial and soil. The parameters adopted were $PM_{2.5}$, associated with organic and inorganic chemical species and meteorological conditions. Inorganic characterization was performed by ICP OES to determine metals (Al, Ca, Cd, Cr, Cu, Fe, K, Mg, Mn, Na, Ni, Pb, Ti, V, and Zn). Organic characterizations were done by GC/FID/MS to determine aromatic (46 PAHs) and aliphatic hydrocarbons (C_{12}-C_{40}). Besides that, the total water-soluble organic compounds (WSOC) were determined by TOC analyzer. Additionally, local meteorological information (relative humidity, temperature, wind speed, radiation intensity, atmospheric pressure and rainfall of the last 48 hours) was also used for a better explanation of the results of the models. The concentrations of $PM_{2.5}$ ranged from 1 to 59 μg m^{-3}, WSOC and metals from less than 1 to 43 μg m^{-3}. Hydrocarbon concentration was found from 0.25 to 19.3 ng m^{-3}. PAH's usually not quantified in environmental, especially the mass 278 and 276, showed a greater ability to discriminate and separate the samples geographically in relation to the origin of the contamination. In Rio de Janeiro Metropolitan area precipitation is the most important meteorological phenomenon affecting particulate matter and hydrocarbon concentrations. More details about the model and its applications and sources are presented in the meeting.