

Chapter 28

Application of PMF for Evaluation of the Fine Particles Contribution from Vehicular Emission in Six Brazilian Cities

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Abstract The vehicular emission is the main source of fine particles in Brazilian Cities. A comprehensive study was performed from 2007 to 2009 with 24 h daily sampling of fine particles in an experimental site in six Brazilian capitals: Sao Paulo, Rio de Janeiro, Curitiba, Porto Alegre, Recife and Belo Horizonte. The polycarbonate filters collected at each site with Harvard sampling, were submitted to gravimetric analysis for identification of PM_{2.5} concentration, to reflectance for Black Carbon concentration, to X-ray fluorescence analysis for elemental composition and to ion chromatography for an ion and cations composition and concentration. The average PM_{2.5} concentration were 28, 19, 17, 17, 16 and 11 $\mu\text{g}/\text{m}^3$ in São Paulo, Rio de Janeiro, Belo Horizonte, Curitiba, Porto Alegre and Recife, respectively. Black Carbon accounted for approximately 30 % of the PM_{2.5} mass concentration in the more air pollution impacted cities: Sao Paulo, Rio de Janeiro and Belo Horizonte. The Black Carbon was used as a tracer for diesel fuel emission and biomass burning. The elemental chemical composition of the PM_{2.5} was used to identify source-related fractions of fine particles, by means of Receptor Models. The results were used to examine the association of these fractions with daily mortality in each of the six cities. Principal Matrix Factorization (PMF) was applied to the elemental concentration data in order to identify the sources of fine particles, specifically the participation of the vehicular emission. These results were compared to the previous analysis performed with Absolute Principal Component Analysis (APCA). The participation of the vehicular fleet to the PM_{2.5} mass concentration was significant, explaining in the most urbanized area even 40 % of its mass. These results show the relative importance of the vehicular emission to health injury.

Keywords Particulate matter • Vehicular emissions • Observations • Principal matrix factorization • Receptor models

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