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Atmospheric aerosol and gaseous pollutant concentrations in Bucharest area using first datasets from the city AQ monitoring network

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City of Bucharest is the largest and most populated (about 2.8 million inhabitants) city in the Romanian Plain and encounters environmental problems and meteorology typical for several cities in southeastern Europe. City environment includes intense emissions arising from traffic (about 1 million cars per day), five thermo-electrical power-generation stations, that use both natural gas and oil derivatives for power generation and domestic heating, and from industrial sources (more than 800 small and medium plants).

In the present work we performed an extensive analysis of the air pollution state for the Bucharest area (inside and outside the city) using filter measurement aerosol data PM_{10} and $PM_{2.5}$. Data spanning over first year of continuous sampling (2005) were taken from the city Air Quality Monitoring Network, which consists of eight sampling stations: three industrial and two traffic, one EPA urban background, one suburban and one regional station located outside of Bucharest.

The objective was to assess the PM_{10} recorded levels and their degree of compliance with the EU-legislated air quality standards and to provide a statistical investigation of the factors controlling seasonal and spatial variations of PM levels. PM_{10} relationships with other measured air pollutants (SO_2, CO, NO_x) and meteorological parameters (temperature, relative humidity, atmospheric pressure, wind velocity and direction) were investigated by statistical analysis. Back trajectory modeling and wind direction frequency distributions were used to identify the origin of the polluted air masses. Contribution of combustion (slopes) and non-combustion (intercepts) sources to PM_{10} recorded levels was quantified by linear analysis, for two seasonal periods: cold (15 October-14 April) and warm (15 April-14 October). PM_{10} and $PM_{2.5}$ concentrations were compared with corresponding values in other European urban areas.

Main conclusions are as follows:

- Traffic and industrial sites contribute to the PM_{10} urban background with about 86%; relative contribution of urban background to regional background is about 37%;
- Relatively low inter-sites correlation coefficients and no significant geographic differences between sites, more or less uniform traffic pattern suggests local sources may play an important role;
- PM_{10}average and median values systematically exceed the limit value of 50 $\mu g/m^3$ at traffic and industrial sites; at background sites the PM_{10} are below 50$\mu g/m^3$ but are higher that values at similar sites in Europe;
- CO and SO_2 do not put serious problems relative to their limits values as NO_x does; NO_x shows a temporal variation with higher values during the cold season;
- All gaseous pollutants contribute to the PM_{10} levels but a significant inter-annual variation of this contribution seems not to be observed;
- Pollution level in Bucharest seems to be higher than in other European cities for traffic, industrial and suburban background sites; regional background in the larger area of Bucharest seems to be similar with the suburban background sites in other European sites.

- Seven pollution episodes were identified, from which only one in the cold season has been attributed to the long-range transport. During this episode PM_{10} levels varied between 161–205 $\mu g/m^3$ for all sites, the dominant wind direction was NE (10.2%), with an average wind speed of 1.6 m/s. This shows that local pollution sources seem to have more impact on AQ than the long-range transport.

Data presented here give an overview of the range of air pollution concentrations to expect under typical meteorological and seasonal conditions in the larger area of Bucharest.

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