



The Environmental Pollution Control Laboratory of the Aristotle University of Thessaloniki (AUTH-EPCL) has been since several years specialized in air pollution studies focused on several topics, such as:

- Chemical characterization of atmospheric particles
- Size distribution of particle mass and chemical components (OC/EC, PAHs, PCBs, OCs, heavy metals, ionic species, etc)
- Chemical characterization of source particulate emissions
- Source identification/ apportionment of atmospheric particles using receptor models
- Wet and dry deposition of acidic aerosol components
- Gas/particle partitioning of SVOCs
- Wet and dry deposition of SVOCs
- Indoor air pollution including tobacco smoke (MSS-ETS)

The majority of the air pollution studies of AUTH-EPCL have been conducted in the greater Thessaloniki area. Thessaloniki (40° 62'E, 22° 95'N) is one of the most densely populated cities in Greece accounting for approximately 16,000 inhabitants km<sup>-2</sup>, and one of the most polluted in Europe concerning atmospheric particles since PM<sub>10</sub> levels exceed systematically the European standards. Vehicular traffic all over the year and residential heating in winter are major urban sources of particles. In addition, particle emissions from the extended industrial area located west/northwest of the city approximate 32,000 tones. The climate in the area is temperate with weak prevailing winds (sea breeze) and frequent calms resulting to inefficient dispersion of atmospheric pollutants and short-range transport.

AUTH-ECPL has conducted several studies aiming at the investigation of the chemical composition of atmospheric particles in Thessaloniki and their size distribution (Voutsas et al., 2002; Manoli et al., 2002; Samara and Voutsas, 2005; Chrysikou et al., 2008). Receptor-oriented source apportionment studies (receptor models) have also been conducted to identify particle sources and quantify source contributions. Early source apportionment studies of AUTH-ECPL were based on statistical receptor models, such as APCA and FA/MR (Samara et al., 1994a & b; Manoli et al., 2002). Recently, the CMB model has been applied using chemical source profiles constructed for local sources and profiles from data bases like the SPECIATE data base of USEPA (Samara et al., 2003; Samara, 2005).

In the last years, there is growing interest from public authorities and industries that need a tool for deciding air pollution abatement measures and developing hierarchical environmental policies for such services. Table 1 lists some CMB source apportionment studies that were conducted by AUTH-EPCL and were funded by Greek public and private institutions.

AUTH-EPCL has all necessary infrastructures for sampling and chemical characterization of ambient and source particles, that is a prerequisite for source apportionment.



Available equipment includes:

- Aerosol samplers for PM<sub>10</sub> and PM<sub>2.5</sub> operated according to EN 12341 and EN 14907 standards, respectively.
- Analytical instruments (GC/MS, GC/MS/MS, GC/ECD, GC/FID, HPLC/FD) for analysis of organic particle components
- ED-XRF for elemental particle analysis
- IC for ionic particle component analysis
- TOC analyzer for WSOC analysis

In addition, AUTH-EPCL has long term cooperation with the Municipality of Thessaloniki and the Region of Central Macedonia which are the major local authorities that are responsible for air pollution monitoring. In the framework of this cooperation, AUTH-EPCL has full access to the data recorded by the air pollution monitoring stations operating in the greater Thessaloniki area.

In the last years, the Environmental Pollution Control Laboratory conducted a number of short-term source apportionment studies in Greece mainly requested by local authorities and the Public Power Corporation of Greece. The studied areas include urban and industrial sites in Thessaloniki, Western Macedonia, Aliveri and Rhodes. The Chemical Mass Balance model and Principal Component Analysis were the methods used by EPCL to quantify aerosol sources.

The experience of AUTH-EPCL in the field of the proposal is also shown by the relevant publications listed below.

- Chrysikou, L.P., Gemenetzi, P.G., Samara, C.A., 2008. Winter time size distribution of polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs) and organochlorine pesticides (OCPs) in the urban environment: Street- vs rooftop-level measurements. *Atmospheric Environment* (article in press).
- Kouimtzi, Th., Samara, C., Tzimou-Tsitouridou R. (2005). Source identification and apportionment of TSP in the area of the Aliveri power plant. Final Report.
- Manoli, E., D. Voutsas and C. Samara. Chemical characterization and source identification/apportionment of fine and coarse air particles in Thessaloniki, Greece. *Atmospheric Environment* 36, 949-961 (2002).
- Samara, C., Th. Kouimtzi, G. Katsoulos, Characterization of Airborne Particulate Matter in Thessaloniki, Greece. Part II: A Multivariate Modeling Approach for the Source Apportionment of Heavy Metal Concentrations within Total Suspended Particles (1994a). *Toxicol. Environ. Chem.*, 41, 221-232.
- Samara, C. (2005). Chemical mass balance source apportionment of TSP in a lignite-burning area of western Macedonia, Greece. *Atmospheric Environment* 39, 6430-6443.
- Samara, C. and Voutsas, D. Size distribution of airborne particulate matter and associated heavy metals in the roadside environment. *Chemosphere* 59, 1197-1206 (2005).
- Samara et al., (2008a). Source identification and apportionment of PM<sub>10</sub> in the area of the Soroni, Rhodes power plant, Final Report, etc.