



# **WeBIOPATR2011**

THE THIRD INTERNATIONAL WeBIOPATR  
WORKSHOP & CONFERENCE  
PARTICULATE MATTER: RESEARCH AND MANAGEMENT

## **ABSTRACTS OF KEYNOTE INVITED LECTURES AND CONTRIBUTED PAPERS**

*Editors*

Alena Bartonova and Milena Jovašević-Stojanović

Public Health Institute of Belgrade

Belgrade 2011

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The Third International WeBIOPATR Workshop & Conference  
Particulate Matter: Research and Management  
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Alena Bartonova  
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## CONFERENCE TOPICS

### ATMOSPHERIC PARTICULATE MATTER - PHYSICAL AND CHEMICAL PROPERTIES

- *sources and formation of particulate matter*
- *particulate matter composition*
- *environmental modeling*
- *particulate matter indoors*
- *nanoparticles in the environment*

### PARTICULATE MATTER AND HEALTH

- *exposure to particulate matter*
- *health aspects of atmospheric particulate matter*
- *assessment of risks and health effects*
- *full chain approach*

### PARTICULATE MATTER AND REGULATORY ISSUES

- *issues related to monitoring of particulate matter*
- *legislative aspects*
- *abatement strategies*

### SPECIAL SESSION – GRADUATE STUDENTS

*For PhD and MSc students to discuss their work related to particulate matter*

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NILU Norwegian Institute for Air Research, Norway

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## RECEPTOR MODELING STUDIES FOR THE CHARACTERIZATION OF PM<sub>10</sub> POLLUTION SOURCES IN BELGRADE

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Atmospheric aerosols have a confirmed role in climate change and radiative budget, impact on human health, effects on ecosystems and local visibility. Previous epidemiological studies indicated statistical associations between mortality and ambient concentrations of particulate matter (PM), particularly fine particles that can more readily penetrate into the lungs and are therefore more likely to increase the incidence of respiratory and cardiovascular disease. One of the main difficulties in air pollution management is to determine the quantitative relationship between ambient air quality and pollutant sources. Source apportionment is the process of identification of aerosols emission sources and quantification of their contribution to the aerosol mass and composition. Identification of pollutant sources is the first step in the process of devising effective strategies to control pollutants. Various receptor models have been used to identify aerosol sources and estimate their contributions to PM<sub>10</sub> (particles less than 10 µm in diameter) concentrations at receptor sites and downwind areas in Europe.

In this study, the Unmix model has been used to analyze the three years (2003-2006) PM<sub>10</sub> data set for source apportionment purpose in Belgrade. Suspended PM<sub>10</sub> particles were collected on preconditioned and pre-weighed Pure Teflon and Teflon-coated Quartz filters (Whatman, 47 mm diameter, 2 µm pore size) using MiniVol air sampler provided with PM<sub>10</sub> cutoff inlets. The elemental composition (Al, V, Cr, Mn, Fe, Ni, Cu, Zn, Cd and Pb) of the PM<sub>10</sub> samples was determined by the atomic absorption spectroscopy method (AAS). Unmix resolved four sources related to resuspended road dust, fossil fuel combustion, traffic exhaust and regional transport mainly from steel and petrochemical industry. In addition, the average source contributions as well as the seasonal variability of the identified sources were also examined. To estimate the local source impacts from various wind directions, the Conditional Probability Function (CPF) was performed for each source using the source contributions estimated from the Unmix coupled with the surface wind direction data.

Hybrid receptor models Potential Source Contribution Function (PSCF) and Concentration Weighted Trajectory (CWT) were used for identification of source regions. The PSCF values can be interpreted as a conditional probability describing the spatial distribution of probable geographical source locations inferred by using trajectories arriving at the sampling site. Since the PSCF method is known to have difficulties distinguishing strong sources from moderate sources, the CWT model that determines the relative significance of potential sources has been additionally performed. To estimate the likely source locations for regional transporting aerosols, the PSCF and CWT were calculated using the daily source contributions to PM<sub>10</sub> concentration deduced from the Unmix and backward trajectories. Air masses back trajectories were computed by the HYSPLIT (HYbrid Single Particle Lagrangian Integrated Trajectory) model through interactive READY system. Daily 48-h back trajectories, started from Belgrade (44.804o, 20.478o) at 12:00 UTC each day, were evaluated for six different heights above the starting point at ground level (200, 350, 500, 750, 1000 and 1200 m). The impact of transported particulate matter on air quality and human health is considered to be significant at receptor areas. In addition, a study of airflow characteristics was performed using cluster analysis of 48-hour backward trajectories of air masses arriving above Belgrade. Airflow directions were grouped into six classes indicating typical origin of air masses. The results suggest that highest PM<sub>10</sub> concentrations were related to the west-southwest and south pathways.

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