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11th International Aerosol Conference

Oral Presentations

ATHENS Greece IAC 2022

ATAS-4: Characterization of non-exhaust aerosol

ATAS-4-01 **Non-exhaust emissions from road traffic in Lisbon: Characterization and pollution indexes**

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ATAS-4-02 **Quantifying non-exhaust emissions in the UK using combined measurement and modelling approaches**

WILLIAM HICKS1, Sean Beevers1, Max Priestman1, Anja Tremper1, Annalisa Sheehan1, James Allan2, Michael Flynn2, William Bloss3, David Green1 | 1Imperial College London, United Kingdom; 2Department of Earth and Environmental Sciences, Manchester, United Kingdom; 3School of Geography, Earth and Environmental Sciences, University of Birmingham, United Kingdom

ATAS-4-03 **Sources of ambient particulate matter in Skopje urban area**

DEJAN MIRAKOVSKI, Blazo Boev, Afrodita Zendelska, Marija Hadzi-Nikolova, Ivan Boev, Tena Shijakova | University "Goce Delcev", Stip, North Macedonia

ATAS-4-04 **Non-exhaust traffic emissions: a size-segregated field study and development of a road dust sampling device**

FEDERICA CROVA1, Vera Bernardoni1, Giulia Calzolai2,3, Maddalena Castelli Dezza1, Alice Corina Forello1,2, Luigi Gianelle4, Franco Lucarelli2,3, Silvia Nava2,3, Sara Valentini1, Gianluigi Valli1, Roberta Vecchi1 | 1Department of Physics, Universita degli Studi di Milano and INFN-Milano, Italy; 2Department of Physics and Astrophysics, Universita degli Studi di Firenze, Sesto Fiorentino, Italy; 3INFN-Firenze, Sesto Fiorentino, Italy; 4ARPA Lombardia, Milan, Italy

ATAS-4-05 **Size and time-resolved source contributions and oxidative potential of non-exhaust sources in Barcelona**

ANGIE ALBARRACIN MELO1, Angeliki Karanasiou1, Barend L. Van Drooge1, Veronica Moreno1, Xavier Querol1, Natalia Moreno1, Oriol Font1, Rafael Bartroli1, Ana Oliete2, Frank Kelly2, Franco Lucarelli3, Giulia Pazzi3, Fabio Giardi3, Fulvio Amato1 | 1Institute of Environmental Assessment and Water Research (IDAEA-CSIC), Barcelona, Spain; 2Imperial College of London, United Kingdom; 3University of Florence, Italy

ATAS-4-06 **Source Attribution and Magnitude Model: A new perspective for fugitive PM10 emissions**

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Sources of ambient particulate matter in Skopje urban area

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In recent years, high air pollution episodes in most of North Macedonia's cities have dominated the headlines, confirming popular view that dirty air is by far the most serious environmental and health issue confronting the country's urban population. The country's capital and most populous city Skopje is frequently at the top of numerous pollution rankings and is among the cities in Eastern Europe and Central Asia that significantly exceed the EU yearly limit value for PM 2.5. (Almeida *et al* 2020). However, the restricted scope and temporally scattered data about pollution sources, allow for scepticism, thwarting any efforts to apply effective abatement techniques.

Main goal of Source Apportionment (SA) study for Skopje Agglomeration was to derive information about pollution sources and the amount they contribute to ambient air pollution levels. The study includes selection of representative receptor/monitoring site, sampling, chemical speciation, and construction of multivariate receptor model, following the European Guide on Air Pollution Source Apportionment with Receptor Models, Revised version, JRC (2019).

Karposh urban background monitoring station, a part of national monitoring network, was selected as representative receptor exposed to the mix of sources in the urban area.

Sampling process was performed fully in line with the requirements of standard gravimetric measurement method for determination of the PM10/PM2,5 mass concentration of suspended particulate matter (EN 12341:2014). The sampling program began on October 29, 2020 and finished on December 4, 2021. A total of 376 daily samples were obtained throughout this period.

The elemental analysis was conducted using energy dispersive X-ray fluorescence spectrometer Rigaku NEX CG according to the EPA/625/R-96/010a Compendium Method IO-3.3. Black Carbon or Elemental Carbon was determined using Magee Scientific, SootScan™ Model OT21 Optical Transmissometer with dual wavelength light source, by applying EPA empirical EC relation for Teflon FRM filters. Water-soluble ions, including sulphate (SO_4^{2-}), nitrate (NO^{3-}), ammonium (NH_4^+), were determined using internally developed extraction procedure and photometric methods.

Receptor model for PM 2.5 mass concentration was developed using positive matrix factorisation software, EPA PMF version 5.0.14. Data set included 34 species and 332 day samples. Analytical uncertainty estimates by species and sample were provided from the lab. In addition to the analytical uncertainty, 10 % extra uncertainty was added to account for the sampling uncertainty.

In total 7 major factors that contribute to PM 2.5 mass were identified, including: traffic, industry, fuel oil burning, soil (mineral) dust, open fire burning, biomass burning and secondary aerosols.

Monthly source contributions for PM 2.5 at both sites clearly indicate high seasonal variability for most of the sources. As identified in previous works, biomass burning remain the largest single source of ambient air pollution, and due to specific temporal distribution, the main driver of high wintertime pollution episodes.

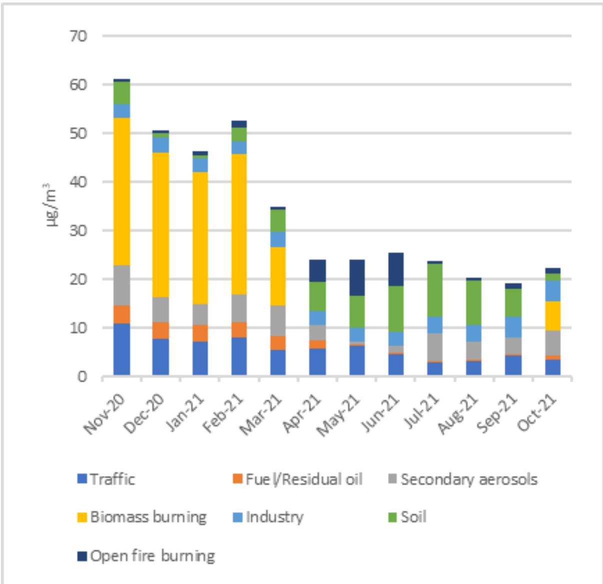

Figure 1. Monthly source contribution for PM 2.5

This work was performed as part of Tackling Air Pollution in the City of Skopje Project, implemented by UNDP-Skopje and SIDA- Sweden's government agency for development cooperation.

Almeida *et al* (2020) *Ambient particulate matter source apportionment using receptor modelling in European and Central Asia urban areas,* Environmental Pollution, Volume 266, Part 3, https://doi.org/10.1016/j.envpol.2020.115199

Mirakovski *et al* (2019) *Wintertime urban air pollution in Macedonia – composition and source contribution of air particulate matter*, Proceedings of the 18th World Clean Air Congress 2019, pp 492-500.