Characterization of Submicron Aerosol in Prague by Combined ME-2 Factor Analysis of AMS Data

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CHARACTERIZATION OF SUBMICRON AEROSOL IN PRAGUE BY COMBINED ME-2 FACTOR ANALYSIS OF AMS DATA

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INTRODUCTION

Real-time measurement of submicron aerosol particles was performed at Prague – Suchdol site (Czech Republic) during six weeks long summer and winter campaigns in 2012-2013. Highly time and size resolved data were obtained from measurements carried out by a Compact Time-of-Flight Aerosol Mass Spectrometer (C-ToF-AMS, Aerodyne). The retrieved data were analyzed with using the So-Fi graphical user interface which is developed by Paul Scherrer Institute (Canonaco, 2013) and is running under IGOR software (WaveMetrics). The preliminary results are presented in this abstract.

DATA PROCESSING

Aerosol data were averaged to 30 min. intervals and analyzed by receptor modelling based on positive matrix factorization. In first step, only organic aerosol (OA) data were analyzed by both unconstrained and constrained technique using Multi-linear engine (ME-2) (Paatero, 1999).

In the next step the OA data were merged with sulfates, nitrates, ammonium, chlorides and potassium data obtained from C-ToF AMS. These combined data matrixes were again analyzed by So-Fi. There was an effort to find similar profiles as we found during the analysis of organic aerosol data.

RESULTS AND CONCLUSIONS

During the analysis of alone organic spectra were determined four factor profiles in both seasons. In summer season were identified hydrocarbon-like organic aerosol (HOA) from traffic, organic aerosol emitted by biomass burning (BBOA) and two secondary OA sources. These were semi-volatile oxygenated organic aerosol (SV-OOA) and low-volatile oxygenated organic aerosol (LV-OOA). In winter season we found also two types of primary organic aerosol (POA) both connected with local heating. Wood burning (WB) and Coal combustion (COAL) aerosols. Two remaining sources were denoted as LV-OOA and SV-OOA+BBOA which mean oxygenated aerosol combined with biomass burning aerosol.

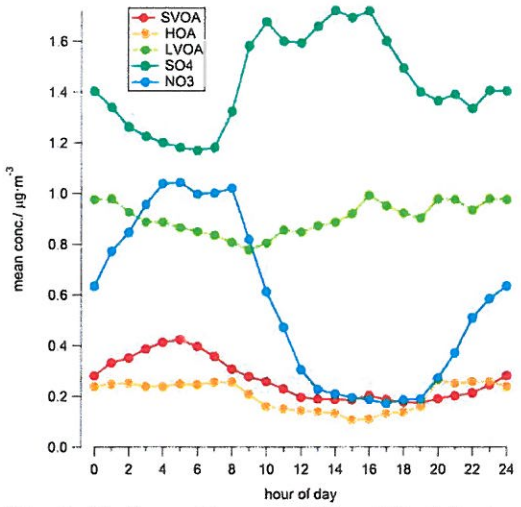

Fig. 1: Daily patterns of identified factors during summer campaign.

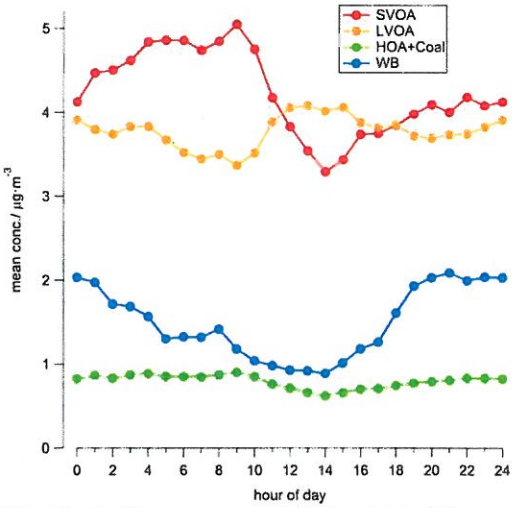

Fig. 2: Daily patterns of identified factors during winter campaign.

The second part was the analysis of combined organic and inorganic mass spectra. As a most promising result for summer campaign seems five factors solution with one constrained factor. Factor HOA constrained with a-value = 0,3 is consisted of fresh organics, potassium and sulfates. Other factors were identified as low-volatile oxygenated aerosol (LVOA) with low contribution of inorganic ions, semi-volatile organic aerosol (SVOA) with a contribution of nitrates and potassium and two mostly inorganic factors consisted of sulfates and ammonia, resp. nitrates and ammonia.

Four factors solution seems to be the best choice for data from winter campaign. Constrained profiles were COAL factor (a-val = 0,25) with contribution from traffic and WB factor (a-val = 0,6). COAL factor is joined mostly with ammonia and nitrate whereas WB factor is strongly related to potassium, chlorides and partly also to other inorganic species. Analogous to summer results the highly oxygenated organic aerosol (LVOA) is connected to sulfates. Factor profile of ammonium and nitrates is supplemented by rather low concentrations of partly oxidized organic aerosol (SVOA).

ACKNOWLEDGEMENT

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