Characterization of submicron aerosol in Prague by source apportionment analysis of combined AMS data

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PM1 non-refractory chemical composition and concentration was measured by Aerodyne Compact Time-of-Flight Aerosol Mass Spectrometer (AMS) during two six weeks long summer and winter campaigns in 2012-2013. The retrieved highly time resolved data were analyzed with using the SoFi graphical user interface which is developed by Paul Scherrer Institute (Canonaco *et al.* 2013) and is running under IGOR software (WaveMetrics).

Aerosol data and error matrixes were trimmed and averaged to 30 min intervals and analyzed by receptor modelling based on positive matrix factorization. In the first step only organic aerosol (OA) data were analyzed by both unconstrained and constrained technique using Multi-linear engine (ME-2) (Paatero, 1999). Four factor profiles were determined in both seasons. In summer season we 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 the same four factors but with slightly different mass profiles. HOA traffic factor was probably mixed up with coal combustion from domestic heating and BBOA factor was influenced by wood burning in local stoves.

In the next step the OA data were merged with sulfates, nitrates, ammonium, chlorides and potassium data also obtained from AMS. These combined data matrixes were again analyzed by SoFi. There was an effort to find similar profiles as we found during the analysis of organic aerosol data. As a most promising result for summer campaign seems a five factors solution with two constrained factors. Factor HOA was constrained with rather high *a*-value = 0,3, because traffic aerosol from city center is already a bit changed when it reaches Suchdol site. BBOA factor was also constrained with *a*-value = 0,3. Other three factors remained unconstrained. LV-OOA factor consisted mainly from organics whereas two remaining factors sulfate combined with ammonium (SO4+NH4) and nitrate with ammonium (NO3+NH4) were mostly inorganic.

Five factors solution seems to be best fitting also for data from winter campaign. Constrained profiles were again HOA factor (*a*-val = 0,3) and BBOA factor (*a*-val = 0,3). HOA factor was combined mainly with chlorides, sulfate and ammonium whereas BBOA factor is related mostly to potassium and partly also to nitrates. Like in summer LV-OOA factor remained mostly organic and both inorganic factors SO4+NH4 and NO3+NH4 also remained almost unchanged. Both inorganic factor profiles were supplemented by rather low concentrations of partly oxidized organic aerosol.

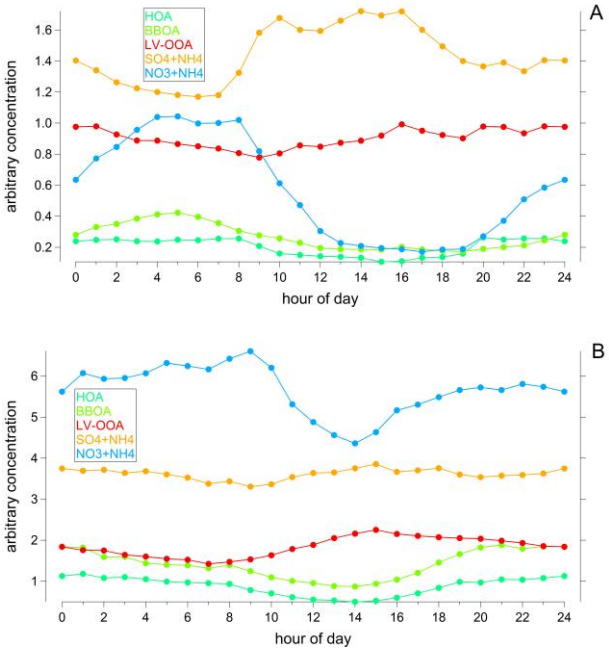

Fig. 1. Averaged daily patterns for combined organic and inorganic mass spectra during summer (A) and winter (B) campaign. The largest differences in daily cycles between summer and winter were caused by temperature.

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