Highly Time-Resolved Aerosol Measurement at a Suburban Site in Prague

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HIGHLY TIME-RESOLVED AEROSOL MEASUREMENT AT A SUBURBAN SITE IN PRAGUE

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INTRODUCTION

Highly time-resolved measurements of atmospheric aerosols are important as they enable us to elucidate the aerosol sources and lifecycle processes (Zhang, 2011). In our study we carried out two six-week measurements of submicron fraction of non-refractory atmospheric aerosol. The measurement was performed with 1-minute resolution and analysed with respect to influence of meteorological conditions. The measurement was done as a part of a pan-European project ACTRIS.

EXPERIMENTAL SETUP

The measurements were done at Prague Suchdol suburban measurement site, which is located approximately six kilometers north west from the Prague city center. During the two measurement campaigns (summer 2012, winter 2013), we deployed the c-ToF-AMS, field Organic Carbon/Elemental Carbon OC/EC analyser and PM1 filter measurement analysed by Ion Chromatography (IC). The c-ToF-AMS provides us with time resolved chemical composition and size distribution of aerosol particles (Drewnick, 2005). The vaporization and ionization occurred at 600°C and 70eV, respectively.

Tab.1: Average composition of non-refractory submicron aerosol during summer and winter campaigns in Prague Suchdol.

	SUMMER		WINTER	
Compound	AVERAGE ± ST.DEV. ($\mu g/m^3$)	SHARE	AVERAGE ± ST.DEV. ($\mu g/m^3$)	SHARE
Org	4.2 ± 3.2	51.2%	8.4 ± 6.9	39.5%
NH_4^+	1.2 ± 0.9	14.0%	2.8± 2.1	13.1%
SO_4^{2-}	2.0 ± 1.6	24.4%	4.4 ± 3.7	20.9%
NO_3^-	0.8 ± 0.9	9.7%	5.4 ± 4.6	25.4%
Cl^-	0.1 ± 0.1	0.7%	0.23 ± 0.26	1.1%
Total	8.3 ± 6.0	x	21.2 ± 16.4	x

RESULTS AND CONCLUSIONS

Table 1 shows the average composition of the summer and winter campaign. In winter, there was a significantly higher share of nitrate than in summer, which we explain by the influence of lower temperatures promoting the particulate phase. From comparison with calculations done using the HYSPLIT model, we found an inverse relationship between the mixing height of the boundary layer and the overall level of pollution. There was also a strong correlation between the arrival of continental (maritime) airmasses and an increased (decreased) level of pollution. The analysis of organic fragments f43, f44, and f60 confirmed the influence of domestic heating on winter aerosol. The high time-resolution enabled us to study the daily cycles in detail. The daily cycles were influenced by the mixing height of the boundary layer, photochemical reactions and entrainment of pollution from higher atmospheric layers.

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