Chemical composition, concentration, size distribution and diurnal variation of atmospheric submicron aerosol particles at the background and urban sites in Lithuania

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The aim of this study is to analyze PM_1 chemical composition, concentration, size distribution and diurnal variation of submicron aerosols particles at the background and urban sites in Lithuania. The quantitative size and chemical composition measurements of PM_1 are essentially important in determining aerosol particles effect on global climate as the major part of all aerosols volume is occupied by PM_1. PM_1 concentration and size-resolved chemical composition were measured with an *Aerodyne* Quadrupole Aerosol Mass Spectrometer (Q-AMS) during campaign in 2011. The detailed description of instrument performance is available in Jayne *et al.* (2000). The measurements of non-refractory particles were performed with a time resolution of 5 min in every sampling site, thus during campaign there were evaluated over 21 million values of measurements.

Rūgšteliškis sampling site is located in a forested area (55º27´48´´N, 26º03´60´´E) at national park of Aukštaitija with the highest point of 188,6 m a.s.l. and with mean average air temperature of 5,8 °C. Preila station is located nearby the Baltic Sea (55º22´24,4´´N, 21º4´4,5´´E) 5 m a.s.l. Rūgšteliškis and Preila sites are considered to be rural/background sites. Urban sampling site is located in the vicinity of Vilnius city, which is industrial centre with a population over 550 000 and residential area of about 400 km^2.

The average concentrations of non-refractory PM_1 chemical components (ammonium NH_4^+, nitrate NO_3^-, sulfate SO_4^{2-}, chloride Cl^- and organics) are presented in Table 1. The concentration of nitrates at polluted site in Vilnius was about twice as high as at Rūgšteliškis and Preila sites. According to O'Dowd *et al.* (2011) the source of nitrate at polluted areas is nitrate oxides from exhaust gases.

Clear diurnal variation of organics and nitrates components was indicated in Vilnius site, whereas in Preila site clear diurnal variation was observed only for chloride component. Clear diurnal variation was observed only at the presence of Northeast wind in Vilnius site.

PM_1 size distribution spectra at Preila site for ammonium and nitrates particles were shifted towards coarse particle size. Possible reason of the spectra shift is conditioned of hydrophilic aerosol particles in Preila station.

Table 1. Average concentration of PM_1 chemical components ($\mu g/m^{-3}$).

Period	NH_4^+	NO_3^-	SO_4^{2-}	Cl^-	Org
Vilnius city site					
03.23-03.28	0,078	0,190	0,253	0,0389	4,11
03.28-04.01	0,299	0,853	0,767	0,0783	6,82
04.02-04.07	0,372	1,20	0,996	0,0714	7,46
04.07-04.18	0,298	0,958	0,888	0,0703	5,86
04.18-04.22	0,113	0,471	0,292	0,0334	5,66
04.22-05.04	0,494	0,921	2,46	0,0675	13,0
05.04-05.13	0,166	0,437	0,775	0,0291	6,80
05.13-05.19	0,128	0,240	0,721	0,0193	2,44
Rūgšteliškis background site					
06.17-06.24	0,193	0,161	0,945	0,0221	4,01
06.24-07.01	0,092	0,055	0,508	0,0115	2,67
Preila background site					
07.03-07.16	0,161	0,070	1,017	0,0104	3,38
07.16-07.27	0,151	0,057	0,962	0,0103	2,20
07.31-08.08	0,115	0,069	0,802	0,0123	3,56
08.08-08.18	0,089	0,055	0,622	0,0112	1,02
08.18-08.24	0,154	0,066	0,865	0,0603	1,68

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