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Detailed study of fine particulate matter during 2013 New Year's celebrations

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In this work we investigated rapid changes in chemical composition of fine particulate matter during the celebrations of New Year 2013. The measurements were carried out at the urban background site Prague-Suchbát. The compact time-of-flight aerosol mass spectrometer (c-ToF-AMS, Aerodyne), Drewnick *et al* (2005), was used to analyze highly time-resolved samples of non-refractory aerosol components. We focused on four episodes with significantly elevated total aerosol mass concentration. The scrutinized intervals are highlighted in Figure 1. We assume that the increased concentrations are due to: smoke plume from wood burning in Episode 1, fireworks in Episode 2, arrival of another air mass in Episode 3, and an uncategorized source of poly-aromatic hydrocarbons in Episode 4. The highest attention was given to the time interval between midnight and 3 a.m. on the New Year (marked in Figure 1 as Episode 2) as the aerosol composition was significantly affected by the occurring annual celebrations. In this period, the most significant increase in mass concentration was observed by sulfate, chlorides, and potassium (involved in the mass spectra for fragment 39). At the same time, nitrate and ammonium were unaffected. Those trends were compared to other measurements with c-ToF-AMS during annual celebrations, Drewnick *et al* (2006).

Available meteorological data from a nearby measuring site were taken into account for explanation of the observed trends.

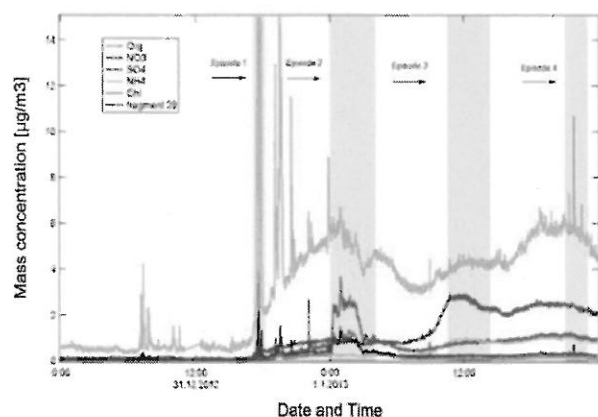


Figure 1. Time course of mass concentrations for various species determined by the c-ToF-AMS. Values over 15 µg are not shown.

Figure 2 shows mass size distributions for the whole period investigated and for the four selected episodes. Similar analyses were carried on for particular species. It is clearly seen that during the first event the particle size distribution was markedly shifted towards smaller sizes. It can be hypothesized that the source of these particles was in close vicinity to the measurement site.

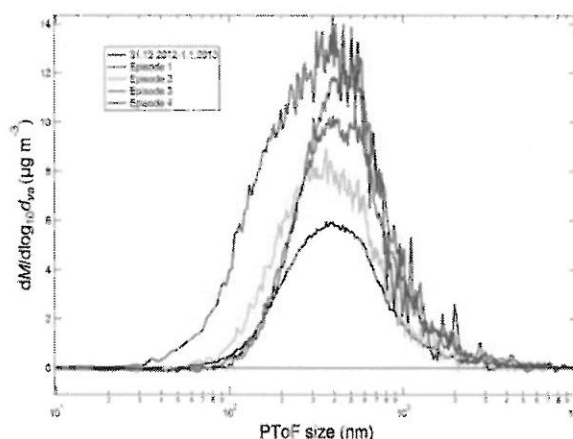


Figure 2. Average mass size distributions measured by c-ToF-AMS for the whole measurement period and for the selected episodes.

Generally, the analysis illustrates the possibilities and advantages of such highly time- and size-resolved measurement of the aerosol chemical composition. It is possible to characterize the individual events thoroughly when a shorter time period is taken into account. Nevertheless, it is necessary to pay attention to correct evaluation of such short events during data analysis.

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