

ATMOSPHERIC AEROSOL VOLATILITY AT A SUBURBAN AND RURAL MEASUREMENT SITE

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Atmospheric aerosol affects climate change, visibility and human health. The formation, lifetime, and removal of atmospheric particles are strongly influenced by their volatility. An accurate description of volatilities of atmospheric aerosol is important for several reasons. It helps to predict the phase-partitioning of particular species and it is also significant for the correct interpretation of aerosol measurement. Moreover, description of particle volatility is necessary for models calculating condensation of semi-volatile species or for calculation of particulate losses in measurement instrumentation due to changes in temperature or pressure. There is still a need for better understanding of volatilities of organic atmospheric aerosol (Huffman et al., 2009).

The main aim of this work was to describe the seasonal differences in chemical and physical properties between a rural and suburban site. Special focus was given to the volatility of organic aerosol.

The measurements were carried out at a suburban background site in Prague Suchdol (50°07' N, 14°23' E) and at a rural background site Košetice (49°34' N, 15°05' E). At each site we performed a six-week measurement campaign in both summer and winter, i.e. four campaigns in total. The main deployed instrument was the c-ToF-AMS (Drewnick et al, 2005). Before entering the c-ToF-AMS the sample alternately passed through a thermodenuder (TD, Aerodyne Research, Inc.) (Huffman et al, 2008) that was heated on 140°C.

The campaigns were further divided into episodes according to the clusters of backward air mass trajectories calculated using the HYSPLIT model (Draxler & Hess, 1998). For each of the clusters a chemical composition of thermodenuded and non-thermodenuded sample was calculated (Figure 1). The chemical composition of non-thermodenuded sample at the suburban site Suchdol was in compliance with a previous measurement at the site (Kubelová et al, 2015). It can be seen from Figure 1 that the least volatile component was sulphate, while organics and particularly nitrate were the most volatile. Ammonia bound in sulphate went through the thermodenuder almost quantitatively, on the other hand ammonia bound in nitrate was almost completely lost.

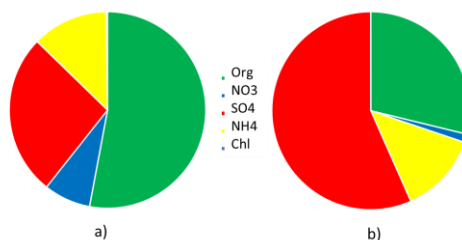


Figure 1. Chemical composition of a sample measured at the rural site Košetice during a summer campaign a) non-thermodenuded sample b) thermodenuded sample.

The particular sample was connected with air mass trajectories coming from the north-east.

We have also compared the mass spectra of the thermodenuded and non-thermodenuded samples. As could have been expected, the increasing mass (m/z) was connected with decreasing volatility.

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