

Characterization of the sources of organic aerosol collected at K-Puszt

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Keywords: carbonaceous aerosol, GC-MS, source apportionment.

Although it has been recognized that organic aerosol plays an increasingly important role in inadvertent climate modification, its origin in the boundary layer as well as in the free troposphere is virtually unknown. Knowing the origin of the organic aerosol is of utmost importance in predicting how future changes in human activities will affect the global distribution and properties of organic aerosol and thus how they will modify global climate.

During the European Integrated project on Aerosol Cloud Climate and Air Quality Interactions (EUCAARI) the anthropogenic, natural as well as primary and secondary aerosol components were studied in samples collected at different sampling sites in Europe. This information will help to determine the concentration of aerosols due to long range transport as well as the influence on AQ/PM of transnational transport within Europe.

In this work we present the results of tracer compound analyses and ¹⁴C measurements of the samples collected at the Central European sampling site K-Puszt. The site is a rural measurement site located on the Great Hungarian Plain, 15 km northwest from the nearest town Kecskemét, and 80 km southeast from Budapest. The surroundings of the measurement site are dominated by mixed forest. Ten samples were collected in summer 2008 under the umbrella of the EUCAARI project by a high volume sampler.

The characterization of the bulk carbonaceous compounds was performed by a thermal optical method. The concentration of the elemental and organic carbon was measured and based on their concentration ratio conclusions were drawn about the importance and influence of the anthropogenic sources. In order to further characterize the carbonaceous components of the aerosol ¹⁴C measurements and H-NMR analyses were also performed on the filters. These results were combined by the results of gas-chromatography-mass spectrometry. With this technique the concentration of biogenic and anthropogenic tracer compounds were determined. Due to the complex nature of the samples, prior the gas-chromatographic analysis the compounds were separated based on their polarity by flash chromatography (Alves et al., 2007). Thus, the polar and less polar compounds were measured

separately. The concentrations of the less polar compounds were measured directly, whereas those of the more polar compounds were determined after derivatisation by BSTFA.

Based on the results we concluded on the importance of the primary and secondary aerosol sources as well as the contribution of anthropogenic and biogenic sources.

It can be established based on the results of the gas-chromatography-mass spectrometric measurements, that the n-alkanes show odd carbon number preference. These compounds are characteristic to the contribution of the waxes of the terrestrial higher plants. We have also measured the amount of the unresolved complex mixture of branched and cyclic hydrocarbon compounds, which give further information about the importance of the anthropogenic sources of the atmospheric aerosol at K-Puszt. However, PAH's can be found both in the gas and the aerosol phase, thus their concentration is highly dependent on the sampling conditions, from their presence in the samples we can conclude on ongoing fossil fuel and other burning processes. The n-alcohols showed even carbon number preference with the C₂₆ compound being the most abundant substance. These compounds are attributable to terrestrial higher plants. The contribution of the biomass burning processes to the aerosol composition was followed by the measurement of the amount of levoglucosan, mannosan and galactosan as well as the aromatic compounds. The fatty acids showed even carbon number predominance, which indicates the contribution of higher plants to the aerosol composition at K-Puszt.

This work was supported by the European Integrated project on Aerosol Cloud Climate and Air Quality Interactions (EUCAARI).

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