Elemental fingerprints of atmospheric aerosol sources and transport in Debrecen, Hungary

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In recent years it became evident, that aerosol pollution in urban environments presents significant health hazard. Particulte matter detected in a city arise from several local (e.g. resuspended dust caused by traffic or soot from heating) and remote (e.g. sea salt or Saharan dust) sources.

The aerosol database of the ATOMKI contains the concentration and elemental composition of fine (particles with aerodynamic diameter < 2.5 μm) and coarse (particles with aerodynamic diameter between 2.5 and 10 μm) particulate matter characteristics to the city since 1993. The aerosol concentration is measured by gravimetry and the elemental composition is determined by acclerator based nuclear analytical methods, mainly Proton Induced X-ray Emission (PIXE). This dataset, which contains over 1100 sampling days and 60 000 concentration data, serves as an ideal base for studying long-term tendencies, variations and long range transport processes of urban aerosols.

In the present talk we show how the elemental composition and elemental ratios are used for the identification and characterization of urban aerosol sources. In addition we identify the remote source areas which contributed to the PM concentration in Debrecen from 1993 to nowadays when high pollution levels were measured. Backward trajectory modelling (NOAA-HYSPLIT) was applied to determine the spread of the aerosol particles, and correlation analysis was employed to identify characteristic elements to different sectors of the continent. Source apportionment was done using the positive matrix factorization method. The contribution of single particle analysis to the characterization of aerosol particles originating from long range transport (eg. Saharan dust) will be also presented.

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