Multiyear Source Apportionment of the Central European Organic Aerosol during Wintertime

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Keywords: Source apportionment, Organic aerosol, ACSM, long-term measurements, ACTRIS
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Introduction

Atmospheric aerosol particles consist of a large number of organic and inorganic compounds that may affect climate, human health and ecosystem. Local air quality is influenced by locally emitted particles from both primary anthropogenic and biogenic sources, as well as secondary sources and aerosol particles transported over long-range distance.

Since 2012, an Aerosol Chemical Speciation Monitoring (ACSM, Aerodyne Inc, Ng et al., 2011) is measuring at the Central European Research Station Melpitz (Germany) as part of the European ACSM network developed within the ACTRIS-Project (European Research Infrastructure for the observation of Aerosol, Clouds and Trace gases, http://www.actris.net). This long-term observatory represents a unique chance to identify and quantify the changes on the aerosol chemical composition. Consequently, it will be therefore possible to better understand and identify the impact of the regulations to the air quality.

Methods

Source apportionment analysis was performed on the organic mass spectra using the multi-linear engine (ME-2) receptor model developed by Paatero et al. (1999) and the Source Finder tool (SoFi, Canonaco et al., 2013) over four consecutives winter (December, January and February). To consider the possible variability of the factor profiles over the years, the rolling windows approach was applied on the source analysis available on the SoFi-Pro version. Factors identification was made by comparison with reference factor profile and available collocated measurements.

Conclusions

A total of 5-factors was identified including three primary anthropogenic organic aerosol (OA) as Hydrocarbon-like OA (HOA, 7%), Biomass Burning OA (BBOA, 16%), Coal Combustion OA (CCOA, 11%) and two oxygenated OA corresponding to processed OA (31% and 36%). Variability of the factor mass concentration and their contributions to total OA over the different winters will be discussed. Additionally, air mass trajectory analysis will be used to identify the potential geographical sources of the different sources.

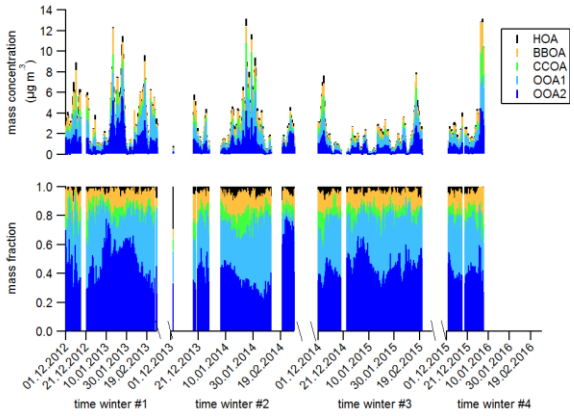

Figure 1. Mass concentration (top) and mass fraction (bottom) of the different identified factors over the winter months.

This work was supported by the infrastructure projects ACTRIS (EU FP7, grant 262254) and ACTRIS-2 (Grant 654109). The work was also supported by the COST action COLOSSAL CA16109.

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