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Sources and components of organic aerosols in Central Europe

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The quadrupole version of the Aerodyne Aerosol Mass Spectrometer (q-AMS) was deployed at several places in Switzerland, Austria, and Liechtenstein. The q-AMS provides real-time information on mass concentration and composition of the non-refractory species in particulate matter smaller than 1 μm (NR-PM1) with high time- and size-resolution at unit mass resolution. The combination of factor analysis and ambient AMS data represents a relatively new approach to identify organic aerosol (OA) sources/components (Zhang et al., 2005). In this study, such an approach (PMF – positive matrix factorization; Lanz et al., 2007, 2008) was applied to various OA data sets covering a wide range of pollution levels (mobile measurements on motorways, urban, rural, and even a high-alpine location) as well as all seasons of the year.

Dominating aerosol components were representing oxygenated and secondary organic aerosol (OOA-I and OOA-II), primary particles from wood burning (P-BBOA; especially in residential areas in wintertime with abundances of ~50% OA and more) and primary traffic-related aerosols (usually ~10% of OA, but up to 60% on motorways). Close to sources, charbroiling and potentially food cooking aerosols could be distinguished as well.

The OOAs' time series were compared to measurements of AMS inorganics (sulphate, nitrate, and ammonium) in order to facilitate their interpretation as secondary OA (SOA). Diurnal cycles of the estimated source strengths, ancillary gas-phase and meteorological data, estimated emission ratios etc. were also used to validate the interpretations of the factor analytical results.

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