Analysis of particulate matter collected on quartz-filters using laser-desorption/ionization-time-of-flight mass spectrometry

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Aerosol effects on climate and health are strongly influenced by the chemical composition of the organic aerosol (OA) and hence by the contributing emission sources and formation processes (Cassée *et al*, 2009). Secondary organic aerosol (SOA) formed via the oxidation of gaseous precursors contributes a large fraction of the total OA (Jimenez et al, 2009).

Mass spectrometers equipped with electron ionization (EI) like the aerosol mass spectrometer (AMS) or the aerosol chemical speciation monitor (ACSM, both Aerodyne Research, Inc.) have been widely used to provide quantitative measurements of the organic aerosol. Source apportionment of AMS and ACSM data has allowed the separation of different primary OA sources as traffic, cooking, and wood burning as well as oxygenated OA typically associated with SOA. While SOA has been separated in two classes with a different degree of oxygenation and volatility, source apportionment of SOA is limited by (i) significant molecular fragmentation due to the EI process, and (ii) convergence of the molecular composition of organic matter due to aging. To address (i), softer ionization techniques such as low-energy laser-desorption/ionization (LDI) may provide additional molecular information, which might be promising for the distinction of SOA contributing precursors (Kalberer *et al*, 2004; Samburova *et al*, 2005).

In this work, we evaluate the use of an LDI-MS (Shimadzu, Axima Confidence) for the direct measurements of particulate matter (PM_{10}) collected on filter samples without the addition of an ionization matrix. This involves the introduction of novel procedures of the mass to charge ratio *m/z* calibration and the measurements of source reference samples (traffic and wood burning) and more than 600 ambient samples. The latter include filters from the full year of 2013 at 9 sites in Switzerland with different emission conditions (strongly wood burning influenced alpine valleys vs urban region). Additionally, fossil-fuel emission influenced samples from Pasadena, (Calnex 2010) were analyzed. Data are treated using positive matrix factorization and the ability of LDI measurements in differentiating the different organic aerosol sources is assessed. First results, show the successful separation of wood-burning emissions (LDI-BBOA, Fig. 1) which is comparable to primary wood-burning contributions estimated by offline AMS analysis (BBOA oAMS)

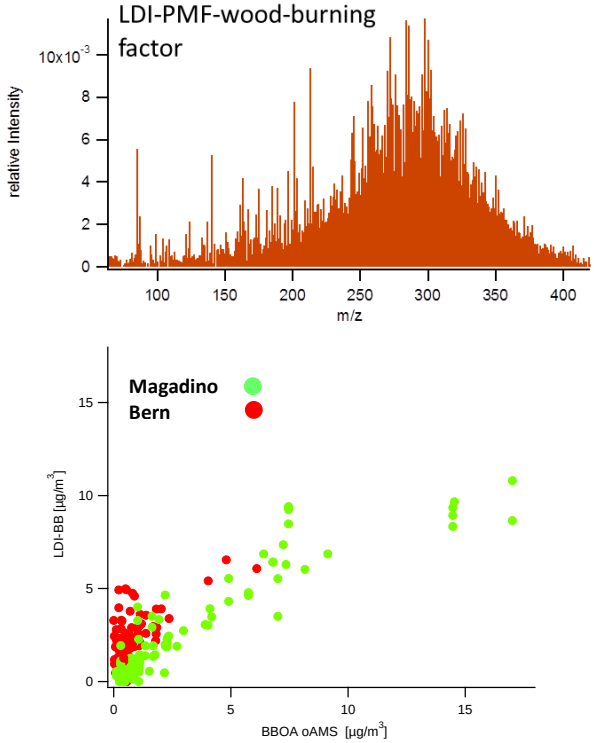

Figure 1: Wood-burning factor profile (upper panel) and comparison of PMF results on biomass burning organic aerosol (BBOA) obtained from 24-hour filter samples with LDI and offline AMS (lower panel).

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