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Contrasting online MS^n spectra of organic acids in ambient aerosol from the boreal forest at Hyytiälä, Finland and from the mixed forest at the Taunus observatory, Germany

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Emission of biogenic volatile organic compounds (BVOCs) by the vegetation and subsequent atmospheric oxidation leads to the formation of secondary organic aerosol (SOA). Therefore, forests are a main source of aerosols which have significant impact on the earth´s climate.[1]
The oxidation of BVOCs results in a variety of mostly unidentified organic species in trace level concentrations, which partition between gas- and particle-phase. Organic acids are of particular importance for the particle-phase fraction, since the higher oxidation state and molecular mass, compared to the corresponding precursors, is accompanied by a much lower volatility. Until now, only limited instrumentation exists for the simultaneous online analysis of organic acids in gas- and particle-phase.
Here we show the first field application of an Atmospheric Pressure Chemical Ionization Ion Trap Mass Spectrometer (APCI-IT-MS) in combination with a miniature Versatile Aerosol Concentration Enrichment System (mVACES) for measuring organic acids in gas- and particle-phase[2]. The benefits of the online APCI-IT-MS are soft ionization with low fragmentation, high time resolution and less sampling artifacts than in the common procedure of taking filter samples, extraction and subsequent detection with LC-MS. Furthermore, the capability to perform online MS^n of isolated *m/z* ratios from ambient and laboratory generated aerosol leads to an improved understanding of the composition of secondary organic aerosol.
The here described measurements were conducted during the HUMPPA-COPEC 2010 campaign at Hyytiälä, Finland and during the INUIT campaign 2012 on Mt. Kleiner Feldberg, Germany. By merging APCI-IT-MS data with data from the Aerodyne´s C-ToF-AMS, it can be observed that the gas- to particle-partitioning of organic acids strongly depends on the fraction of aerosol which is organic matter, as it is predicted by a partitioning model[3]. High observed gas-phase concentrations of organic acids at Hyytiälä are a strong hint for unidentified species. This can be supported by MS^n observations, where the fragmentation pattern from Hyytiälä show different signals compared to the fragmentation pattern from the same *m/z* ratio at the Taunus Observatory and from chamber terpene ozonolysis.

Literature:

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