



## **An overview on non-refractory PM<sub>1</sub> chemical composition and OA sources in Central Europe (2002-2009)**

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Real-time measurements of non-refractory submicron aerosols (NR-PM<sub>1</sub>) were conducted within the greater Alpine region (Switzerland, Germany, Austria, France and Liechtenstein) during several week-long field campaigns in 2002-2009. This region represents one of the most important economic and recreational spaces in Europe. A large variety of sites was covered including urban backgrounds, motorways, rural, remote, and high-alpine stations, and also mobile on-road measurements were performed. Inorganic and organic aerosol (OA) fractions were determined by means of aerosol mass spectrometry (AMS). The average mass concentration of NR-PM<sub>1</sub> for the different campaigns typically ranged between 10 and 30  $\mu\text{g m}^{-3}$ . Overall, the organic portion was most abundant, ranging from 36% to 81% of NR-PM<sub>1</sub>. Other main constituents comprised ammonium (5-15%), nitrate (8-36%), sulfate (3-26%), and chloride (0-5%). These latter anions were, on average, fully neutralized by ammonium. The variability in aerosol chemical composition in this region could be largely explained when the measurement campaigns were sorted by time of the year and position of the sites (Alpine valleys, elevated sites in the Alps, or Plateau sites). The OA was further divided (based on factor analysis, FA) into its underlying components, such as oxygenated (mostly secondary) organic aerosol (OOA), hydrocarbon-like and freshly emitted organic aerosol (HOA), as well as primary OA from biomass burning (P-BBOA). OOA was ubiquitous, ranged between 36% and 94% of OA, and could be separated into a low-volatility and a semi-volatile fraction (LV-OOA and SV-OOA) for all summer campaigns at low altitude sites. Primary wood combustion (P-BBOA) accounted for a considerable fraction during wintertime (17-49% OA), particularly in narrow Alpine valleys P-BBOA was often the most abundant OA component. HOA/OA ratios were comparatively low for all campaigns (6-16%) with the exception of on-road, mobile measurements (23%).