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Time- and size-resolved characterization of submicron aerosol particles collected in during MEGAPOLI in Paris, France using an Aerodyne Aerosol Mass Spectrometer.

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The chemical and physical properties of submicron aerosol particles were analysed during the MEGAPOLI (Megacities: Emissions, urban, regional and Global Atmospheric POLlution and climate effects, and Integrated tools for assessment and mitigation) campaign onboard the French ATR-42 aircraft. The composition and evolution of the megacity plume was monitored in-situ using an aerosol mass spectrometer (AMS) and other online instrumentation. These online measurements included an optical particle counter, particle size information using a scanning particle mobility sizer, and gas-phase measurements. Using the AMS, size-resolved chemical composition of non-refractory submicron particles (NR-PM_1) were obtained at 1-min resolution. The average composition of NR-PM_1 during this study was 53% organics, 27% sulfate, 7% nitrate, 12% ammonium, and 2% chloride. We present preliminary results from positive matrix factorization analysis of the AMS organic mass spectra. Three substantial organic components were resolved. Two of the components contain substantial organic oxygen and are termed a semi-volatile oxygenated organic aerosol particle (SV-OOA) and a low-volatility OOA (LV-OOA). A primary hydrocarbon-like organic aerosol particle (POA) is also resolved. The LV-OOA component is highly aged and is normally detected outside of the main pollution plume and is linked to regional airmasses. The SV-OOA and POA are strongly correlated with NO_3 particles and are interpreted as being nearly all anthropogenic in origin. The SV-OOA and POA components are measured with higher concentrations in the pollution plume than outside the plume. Using the AMS instrument combined with other offline instrumentation and multivariate analysis we show that we can describe in detail the origin and evolution of the organic aerosol particles collected during the MEGAPOLI experiment.