# A Year-long C-TOF-AMS Dataset in London: Investigating Chemical Composition, Seasonal Trends and Sources of Aerosols

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Keywords: aerosols, London, AMS, PMF.
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An Aerodyne compact Time-of-Flight Aerosol Mass Spectrometer (cToF AMS) was deployed in London as part of the Clean Air for London (ClearfLo) project. A full calendar year of data were collected, covering the two major intensive observation periods (IOPs) in the winter and summer of 2012 during which aerosols, radicals, gases and meteorological parameters were measured by a suite of state-of-the-art instrumentation. Measurements were also conducted before, during, and after the 2012 summer Olympic Games which were held in the city.

The cToF AMS was located in a permanent London Air Quality Network (LAQN) monitoring station representative of an urban background environment from 11 January 2012 until 23 January 2013 (Fig. 1). The IOP measurements also took place at this site in North Kensington. Both clean westerly conditions and more polluted conditions including transported European plumes were experienced at the site. Contrasting meteorological conditions, such as inversions and heat waves, also influenced the site throughout the year.
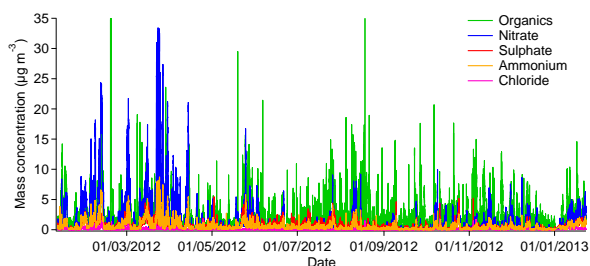


Figure 1. Time series of organic and inorganic mass concentrations measured by the cToF AMS.

Distinct diurnal profiles (Fig. 2) for the entire year of data are observed for the organic aerosols with peaks in concentration either side of midday and a large evening peak. The diurnal profile of nitrate exhibits a morning peak and afternoon trough. Seasonal trends are also evident with a change in the dominant species from nitrate to organic between winter and summer.

Preliminary positive matrix factorization (PMF) analysis identified at least five factors (Fig. 3) as potential sources for the organic aerosols in this urban environment. Primary organic aerosols include

hydrocarbon-like (HOA), solid fuel (SFOA), and cooking (COA). Both type 1 and type 2 oxygenated secondary organic aerosols are identified.
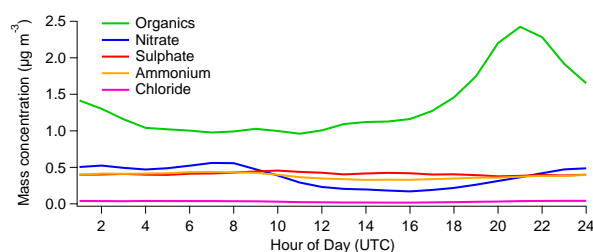


Figure 2. Median diurnal profiles of organic, nitrate, sulphate, ammonium, and chloride species.

There is a near equal contribution of primary and secondary aerosols to the total organic mass of the whole year, where primary aerosol dominate in the winter and secondary aerosols dominate in the summer.
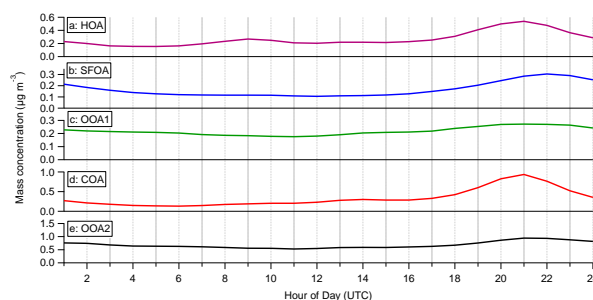


Figure 3. Median diurnal profiles of 5-factor solution from preliminary PMF analysis of organic data.

Long-term cToF AMS data, including solutions from PMF analysis will be presented, highlighting diurnal and seasonal characteristics of London urban background pollution. These data will be used to identify sources of organic aerosols and how these change with time. Furthermore the factors from PMF analysis can be used to target factors in future Aerosol Chemical Speciation Monitor (ACSM) studies at the same site.