

# Evaluation of ACSM response to different mixtures of organic and inorganic solutions, and assessing the impact on organic source apportionment results

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## Introduction

Real time and long-term monitoring of aerosol chemical species is the subject of great scientific concerns and numerous technological developments. The Aerodyne Aerosol Chemical Speciation monitor (ACSM) has been developed for this purpose. It is currently operational at over 60 monitoring stations worldwide, with almost half of them being located in Europe (notably within the Aerosols, Clouds, and Trace gases Research InfraStructure). Understanding the response of these instruments to different chemical species and quantifying any possible artefacts is essential if we are to use these measurements for comparative studies and for model evaluation and development. A few recent studies have illustrated such possible measurement artefacts, notably at the m/z 44 peak (Crenn et al, 2015, Frohlich et al, 2015). The related variability in instrument response has been linked to an artefact response to inorganic aerosol (Pieber et al., 2016), however more recent work has illustrated that this response is dependent on aerosol mixing state (Freney et al., 2019). Here, we present results of laboratory experiments where the m/z 44 artefact was evaluated for various inorganic and organic mixtures, and a co-located measurement campaign in ambient air.

## Methods

Experiments took place at the Aerosol Chemical Monitor Calibration Centre (ACMCC, Paris region, France) in Nov.-Dec. 2018, including five PM1 (particulate matter less than 1 microns) and one PM2.5 quadrupole ACSM. Experiments were first initiated with pure ammonium nitrate and pure ammonium sulphate to identify any existing artefacts in each instrument. Then a series of pure organic solutions were atomized simultaneously into all instruments, these included Levoglucosan, Succinic acid, and Glutaric acid. This was followed by tests with a series of mixtures of organic and inorganic solutions. All atomized solutions were dried and passed through a differential mobility analyser to select only those particles having diameters of 300 nm. These data were then analysed to extract the enhancement of the m/z 44 in the mixtures that may have been caused by the presence of inorganic

compounds. These tests were then followed by a month-long intercomparison campaign in ambient air.

## Results

As part of this presentation, we will present first results of the response of a series of ACSM instruments to different organic compounds and assess the significance of the m/z 44 artefact resulting from mixtures with inorganic solutions (e.g., Figure 1).

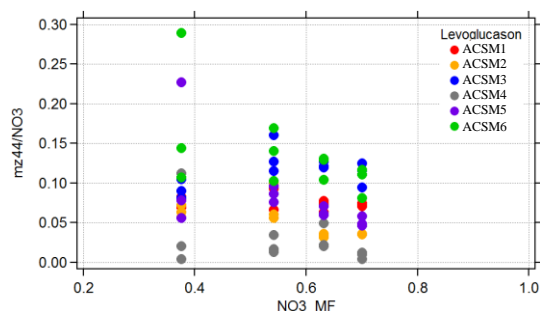


Figure 1. m/z 44 artefact resulting from the presence of inorganic compounds mixed with organic solutions.

We will also provide an overview of the source apportionment analysis on the 6 instruments over the three-week sampling period, and determine how instrument artefacts can play a role in the characterisation of different organic factors.

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