

# High time resolution measurement of the OM to OC ratio in PM<sub>1</sub> and PM<sub>2.5</sub>

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## Introduction

Measurements of carbonaceous aerosols are of vital importance for air quality monitoring and quantifiable measurements of climate change. Because they are extremely diverse, their direct impact on air quality, visibility, cloud nucleation and cloud optical properties, the planetary radiation balance, and public health varies greatly with composition. This impact remains highly uncertain due to their complex chemical and microphysical properties. We present here a highly time-resolved online measurement of carbonaceous aerosol species in Paris, France.

## Methods

Two sets of collocated instruments were employed to measure OM, TC and BC in PM<sub>1</sub> and PM<sub>2.5</sub>: Quadrupole Aerosol Chemical Speciation Monitors (Q-ACSM) with PM<sub>1</sub> and PM<sub>2.5</sub> aerodynamic lenses (Zhang et al., 2017); Total Carbon Analyzers TCA08 and Aethalometers AE33 (Drinovec et al., 2015) with PM<sub>1</sub> and PM<sub>2.5</sub> inlets. The new high time resolution TC-BC method determines equivalent organic carbon fraction of carbonaceous aerosols as

$$\text{eOC} = \text{TC} - b \cdot \text{BC},$$

where the experimentally determined proportionality parameter  $b$  is region/site-specific and depends to a large extent on the thermal protocol used to determine the EC fraction with the conventional OC/EC method. The TC-BC method was validated by comparing averaged high time resolved data (TC, BC) to the OC/EC analysis of 24-hour filters using the EUSAAR2 thermal protocol (EN 16909:2017).

This study was conducted at the SIRTa observatory located about 20 km southwest of Paris in November and December 2018 during the third ACTRIS ACSM intercomparison (Crenn et al., 2015). Measurements at SIRTa are representative of the regional background pollution.

## Conclusions

The linear regression between Q-ACSM OM measurements and eOC data from the TC-BC method is used to determine OM/eOC ratio in PM<sub>1</sub> (Fig. 1) and PM<sub>2.5</sub>. High-time resolution of the compared

methods allows us to explore the temporal variations of the OM/eOC ratio in both PM fractions. The OM/eOC ratio shows a large variability and points to different origins of respective pollution episodes (Fig. 1). The highly time resolved measurements also have a potential to be used for quality control in aerosol mass spectrometry through comparison of differently derived OM/OC ratio values.

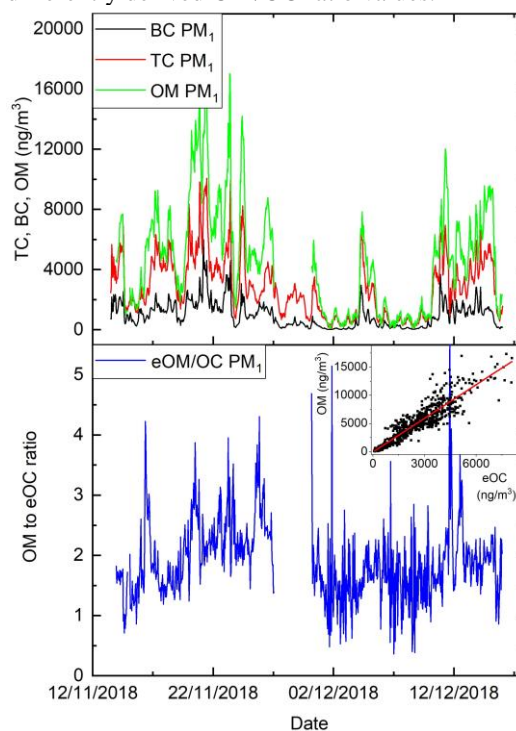


Figure 1. Timeseries of 1-h time resolution data of TC, BC, OM (top) and OM/eOC ratio (bottom) in PM<sub>1</sub> measured during the intercomparison. Linear regression OM/eOC plot (inset) parameters: slope = 1.98, intercept = -24.8 ng/m<sup>3</sup>, R<sup>2</sup> = 0.85.

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