

# Continuous Yearlong High-resolution Measurements of VOCs in Athens, Greece.

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## Abstract

Volatile Organic Compounds (VOCs) are key atmospheric constituents contributing significantly to atmospheric chemistry. VOCs are emitted from various biogenic and anthropogenic sources with impacts on air quality, human health, and climate; inducing thus the need for continuous monitoring in both urban and background areas to get information for their levels and profile. In this study, VOCs measurements conducted at the urban background Thessio Air Monitoring Station of the National Observatory of Athens, Greece, during a full year starting in July 2023, are presented. A PTR-Q-MS 500 system (Ionicon Analytic) was used for the measurements. Among the variety of compounds detected, emphasis is given here on compounds such as BTEX, isoprene, monoterpenes, and acetonitrile due to their role in atmospheric processes and use as tracers of specific sources. Important day-to-day variability was observed depicting changes in emission sources, including periurban fires during summer and residential wood combustion during winter. A major fire occurred in August 2023 in the Parnitha mountain W-NW of Athens and was investigated in detail. Acetonitrile, which is related to combustion processes exhibited an increase of about 100% during the fire, whereas isoprene and benzene followed with approximately 50% enhancement. The mean concentrations of benzene, acetonitrile, and monoterpenes during the rest of August were  $0.26 \pm 0.18$ ,  $0.35 \pm 0.04$ , and  $0.27 \pm 0.22$  ppb respectively. During the Christmas and New Year period characterized by wood burning for domestic heating purposes, there was also a notable change in VOCs concentration profiles compared to the rest of the year. Acetonitrile, isoprene and the terpenes had similar temporal variability with high correlation to  $BC_{wb}$  ( $R^2$  exceeding 0.8) highlighting the impact of wood combustion on air quality in the city. The simultaneous gaseous and aerosol data during the sampling period are used to quantify the contribution of VOC sources in the center of Athens.

## Early Career Scientist

YES, I am an early career scientist.

## IGAC Activities

MAP-AQ: Monitoring, Analysis and Prediction of Air Quality, BBURNED: Biomass Burning Uncertainty: ReactionS, Emissions and Dynamics