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First year of real-time VOC measurements at the SIRTA facility (Paris region, France): diurnal and seasonal variabilities, impact of lockdowns on air quality

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Volatile Organic Compounds (VOCs) have direct influences on air quality and climate. They also play a key role in atmospheric chemistry, as they are precursors of secondary pollutants, such as ozone (O₃) and secondary organic aerosols (SOA).

Long-term datasets of in-situ atmospheric measurements are crucial to characterize the variability of atmospheric chemical composition. Online and continuous measurements of O₃, NO_x and aerosols have been achieved at the SIRTA-ACTRIS facility (Paris region, France), since 2012. Regarding VOCs, they have been measured there for several years thanks to bi-weekly samplings followed by offline Gas Chromatography analysis. However, this method doesn't provide a good representation of the temporal variability of VOC concentrations. To tackle this issue, online VOC measurements using a Proton-Transfer-Reaction Quadrupole Mass-Spectrometer (PTR-Q-MS) have been started in January 2020.

The dataset acquired during the first year of online VOC measurements is analyzed, which gives insights on VOC seasonal variability. The additional long-term datasets obtained from co-located measurements (O₃, NO_x, aerosol physical and chemical properties, meteorological parameters) are also used for the sake of this study.

Due to Covid-19 pandemic, the year 2020 notably comprised a total lockdown in France in Spring, and a lighter one in Autumn. Therefore, a focus can be made on the impact of these lockdowns on the VOC variability and sources. To this end, the diurnal cycles of VOCs considered markers for anthropogenic sources are carefully investigated. Results notably indicate that markers for traffic and wood burning sources behave quite differently during the Spring lockdown in comparison to the other periods. A source apportionment analysis using positive matrix factorization allows to further document the seasonal variability of VOC sources and the impacts on air quality associated with the lockdown measures.