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In situ VOC measurements in the center of Paris under local biogenic influence (Spring- Summer 2022)

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It is generally acknowledged that urban vegetation improves the environmental quality of cities around the world as they can provide ecosystem services like mitigation of urban heat island effect, and capture of atmospheric pollutants by the leaf surfaces. However, vegetation is also a source of Biogenic Volatile Organic Compounds (BVOC), that can be targets of oxidants produced from chemical interactions with anthropogenic atmospheric pollutants. Such oxidation phenomena trigger the formation of secondary pollutants like ozone (O_3) and secondary organic aerosols (SOA). As part of the sTREEt (Impact of **sT**ress on u**R**ban tr**EE**s and on ci**t**y air quality) project, the present work aims to (i) characterize the ambient gaseous composition in the center of Paris (Town Hall) impacted by a local biogenic source (an urban garden and street trees) and subjected to significant anthropogenic contributions (mainly traffic), and (ii) estimate the contribution of BVOC (*vs* Anthropogenic VOC) and ultimately their impact on the ambient air quality (O_3, SOA). A field campaign took place in Paris city center, from June 8th to July 6th, 2022, notably including a heat wave period on June 17th and 18th (with temperature up to 37°C). The experimental set-up comprised continuous measurements of VOC (using PTR-ToF-MS), NO_x (as traffic tracer), aerosol chemical composition (using ACSM) and meteorological parameters (i.e., temperature, wind, light irradiation). VOCs speciation (including terpenes) was also performed off-line based on cartridges analyses for selected days. Results are presented and compared here with measurements at a suburban site at the SIRTA-ACTRIS facility (20 km SW of Paris).

The overall VOC concentrations at the town hall site were higher than at the SIRTA site. Furthermore, isoprene and monoterpenes were mainly of anthropogenic origin, with a diurnal variability and a strong correlation with traffic markers (NO_x and aromatic VOC). However, during

the heat wave, the concentrations of isoprene and monoterpenes increased and showed a different variability than that of the traffic markers. The concentration of isoprene became very significant with levels around 6 ppb (comparable to the SIRTA site), due to the increase in the biotic component, which may promote the formation of ozone. On the other hand, the moderate increase in monoterpene concentrations (0.1 to 0.7 ppb), due as well to the increase in the biotic component, could contribute significantly to the SOA formation. Thus, assuming a near future increase in the frequency and intensity of heat waves, the contribution of the biogenic source to the ambient air quality may be even more important in urban areas with strong anthropogenic contributions.