

International Master 2 Atmospheric Sciences: Research Training 2020-2021

Laboratory: SAGE

Supervisor: de BRITO Joel; SALAMEH Thérèse

Tél : 03.27.71.26.09, E-mail : joel.brito@imt-lille-douai.fr ; therese.salameh@imt-lille-douai.fr

CaPPA Work Package: WP-1 From gas phase to aerosols

Development of an accurate VOC sampling system based on drone technology

Volatile Organic Compounds (VOCs) play a crucial role on Earth's atmosphere, affecting the oxidative capacity and serving as precursors for secondary pollutants such as ozone and particulate matter. Although precise measurements at trace levels are conducted routinely, such observations are often performed at ground level with expensive instruments, on a fixed point (tower, container), raising questions regarding their representativeness on complex environments such as urban or forested areas.

In recent years, multi-copter drone systems have proven to be an accessible and complementary tool to fixed (e.g. ground, tower) and mobile (e.g. aircraft, tethered balloon) atmospheric measuring platforms. Although drones have already been used for sampling greenhouse gases, aerosols particles and some VOCs, fast-developing technologies allow nowadays for lighter and smarter systems to reach unprecedented atmospheric observational capabilities. On this context, the ALPAGA (**A**erial **L** Platform for sampling **A**tmospheric **G**ases and **A**erosols) project combines atmospheric and computer scientists to develop autonomous systems and multi-drone coordination capable of accurate atmospheric sampling contributing to spatio-temporal mapping of pollutants.

The objective of this project is to develop the analytical tools for measuring VOCs in the atmosphere onboard a DJI M600 Pro drone, a 1.7m wide instrument capable of carrying up to 5kg of payload. Activities will include testing different measurement designs and evaluating their performance with a particular focus on biogenic VOCs. Furthermore, the student will work together with a postdoctoral researcher for the nacelle design and remotely controlling the sampling system. The system shall be validated based on field deployments.

This experimental work will support the next generation of drone systems to better understand the coupling biosphere/atmosphere and their effect on secondary pollutants and more broadly climate change.

Key words: Drone, VOCs, atmospheric composition, gas chromatography