

## International Master 2 Atmospheric Sciences: Research Training 2022-2023

**Laboratory:** CERI EE

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**Eventually CaPPA Work Package:** WP 1 (From gas-phase to aerosols: biogenic VOCs as precursors for particles)

### On the importance of photolysis of oxygenated terpenes in the atmosphere

Emissions of terpenes represent about 10-20% of the global emissions of volatile organic compounds from natural ecosystems (Guenther et al., *Atmos. Environ.* 2000). **Due to climate changes, these emissions are expected to increase in the future** (Penuelas and Staudt, *Trends Plant Sci.* 2010). Once in the atmosphere, terpenes show a very high reactivity towards the main oxidants (OH and NO<sub>3</sub> radicals, ozone) and form reaction products characterized by carbonyl (-C=O) and/or hydroxyl (-OH) functions (Calogirou et al., *Atmos. Environ.* 1999). **The further oxidation of these compounds** (coming either from direct emissions or from photochemical reactions) **is poorly known**, both in terms of kinetics and products. This lack of data affects our ability to predict future changes in air quality using atmospheric chemistry models.

**The present internship aims at improving our knowledge about the chemistry of oxygenated terpenes in the atmosphere.** This experimental work is part of a national project (INSU-CNRS Lefe-Chat) involving Reims University (GSMA lab) and Rennes University (IPR lab). In the internship, it is planned to investigate the **photolysis of verbenone** (C<sub>10</sub>H<sub>14</sub>O). Indeed, preliminary experiments have suggested that this compound is particularly sensible to UV-A radiations. **The objective will be to evaluate the importance of the photolysis process from an atmospheric point of view.** Atmospheric simulation chambers will be used coupled to a mass spectrometer (PTR-MS) and chromatographic techniques (TD-GC-FTIR-FID, TD-GC-MS). A spectroradiometer will be used to characterize the irradiation inside the chamber through NO<sub>2</sub> actinometry. Photolysis kinetics and products will be determined, enabling the reaction mechanism to be elaborated. Measurements of peroxy radical concentrations using a PERCA (Peroxy Radical Chemical Amplification) instrument could also be carried out to better constrain the oxidation mechanism. The student will benefit from the help of an engineer for the chamber experiments and use of instruments.

**Key words:** Atmospheric chemistry, photolysis, carbonyls, terpenes