

## Thesis in Atmospheric Chemistry

**Laboratory for Physico-Chemistry of the Atmosphere (LPCA)  
University of Littoral Côte d'Opale (Dunkerque, France)**

**Title:** Study in the new simulation chamber CHARME of the atmospheric reactivity of Volatile Organic Compounds (VOCs) precursors of Secondary Organic Aerosols (SOAs)

**Period:** from October 2020 to September 2023 (3 years)

**Deadline to apply:** 01/06/2020

### Context

Large amounts of Volatile Organic Compounds (VOCs) are emitted in the atmosphere by biogenic and anthropogenic sources. Their reaction with atmospheric oxidants can be a source of ozone and also contribute to the formation of Secondary Organic Aerosols (SOAs). Atmospheric aerosols scatter and absorb solar and terrestrial radiations, influence cloud formation and participate in heterogeneous chemical reactions, thereby affecting the abundance and distribution of atmospheric trace gases. As a result, aerosols markedly affect the radiative balance of the Earth's atmosphere and play a central role in climate. Moreover, aerosols also have impacts on air quality and affect human health.

One of the main uncertainties in the estimation of the radiative effect of the aerosols concerns the contribution of secondary organic aerosols. SOAs originate from chemical transformations of primary volatile organic compounds to lower volatility products that partition into the condensed phase. About 20% to 90% of the aerosol mass would be constituted by organic matter and more than 60 % of this fraction would be from secondary origin.

### Objectives

This research work consists in investigating the atmospheric oxidation processes with nitrate radicals ( $\text{NO}_3$ ) of VOCs precursors of secondary organic aerosols. The expected results are the rate coefficients determination, reaction products characterization and mechanism elucidation. The physico-chemical properties (composition, hygroscopicity and radiative impact) of the SOAs formed from these reactions will also be studied.

The experiments will be performed in the new LPCA simulation chamber. CHARME (Chamber for the Atmospheric Reactivity and the Metrology of the Environment) is a 9.2 m<sup>3</sup> cylindrical reactor in electro-polished stainless steel equipped with 4 xenon arc lamps to simulate the solar irradiation and coupled to a large panel of instruments dedicated to the analysis of gas and aerosol species of atmospheric interest: thermal desorber-GC-MS-FID, PTR-ToF-MS,  $\text{NO}_x$  and ozone analyzer, SMPS, IBBCEAS (for  $\text{NO}_3$ ,  $\text{NO}_2$ )...

This research work enters in the field of the activities developed in the Labex CaPPA<sup>1</sup> and the CPER CLIMIBIO<sup>2</sup>.

**Candidate profile:** A master in chemistry, physico-chemistry or atmospheric sciences is required. Knowledge in analytical chemistry (chromatography, mass spectrometry, spectroscopy...) are also desirable.

**Application:** Please send a detailed CV, a letter of application with research interest and contact details of the supervisor of the Master 2 internship to Dr. Cécile COEUR - email address: [coeur@univ-littoral.fr](mailto:coeur@univ-littoral.fr)

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<sup>1</sup> <http://www.labex-cappa.fr/>

<sup>2</sup> <http://climibio.univ-lille.fr/>