

**General information**

Reference : UPR3021

Workplace : Orléans

Scientific responsible name : Max MCGILLEN

Type of contract : PhD student contract / thesis offer

Contract period : 36 months

Start date of the thesis : 1 October, 2023

Proportion of work : full time

Remuneration : 2 135,00 € gross monthly

**Description of the thesis topic**

PhD project (2023–2026)

Chemical cycles operating in Earth's atmosphere are responsible for many important phenomena, and have major consequences for air pollution, climate change and the evolution of the atmosphere over time. Some of the reactions within these cycles exhibit isotopic fractionation. This process leaves a fingerprint on the products of these reactions. If records of these products are preserved, as in the case of ice cores, for example, the isotopic analysis of these records can provide vital information about how Earth's past environment changed over time.

Current developments in clumped isotopic chemical analysis techniques should provide chemical information of unprecedented detail, allowing us to understand isotopic enrichment on the scale of molecules rather than bulk samples. The goal of this project is to study selected cycles involving sulphur and nitrogen chemistry in several reaction chambers: HELIOS (CNRS, Orléans) and CESAM (UPEC, Paris). Both of these chambers are uniquely well-equipped to understand atmospheric chemical composition in fine detail, which will be used to develop detailed atmospheric degradation mechanisms. At the same time, isotopic composition will be studied using a state-of-the-art orbitrap technique, which will be used for isotopic analysis in collaboration with Institut de Geosciences de l'Environnement (Grenoble).

**Work context:**

The successful applicant will join expert multidisciplinary teams at the Institut de Combustion, Aérothermique, Réactivité et Environnement (ICARE), CNRS-Orléans; the Laboratoire Inter-Universitaire des systèmes Atmosphériques (LISA), L'Université Paris-Est Créteil; and the Institut de Geosciences de l'Environnement, where they will receive guidance and assistance from our international teams of researchers and engineers on laboratory experiments, chemical analyses and theoretical methods. Furthermore, you will be expected to interact with other members of the DOC-PAST European project, including analytical chemists, mass spectrometry experts, spectroscopists, and Antarctic fieldwork specialists. In addition, the student will have access to relevant training courses available at our partner universities.

The applicant will conduct precise and thorough laboratory experiments using the broad range of experimental and analytical facilities that are available. As ACTRIS National Facilities, our laboratories maintain close partnerships with other European facilities, and the student will be expected to collaborate with visiting scientists as well as travelling to other institutions as the need arises. Many of the measurements that are made will be new to science, and the student will be expected to communicate their findings at international conferences, workshops and in journal articles.

**Constraints and risks:**

N/A

**Additional information:**

Project Team

Max MCGILLEN (CNRS/ICARE, Orléans, France) – supervisor (max.mcgillen@cnrs-orleans.fr)

Bénédicte PIQUET-VARRAULT (LISA, Paris, France) – co-supervisor. (benedicte.varrault@u-pec.fr)

Joël SAVARINO (IGE, Grenoble, France) – project leader (joel.savarino@cnrs.fr)

