PHD OFFER

HISTORICAL AND LONG-TERM TRENDS OF ATMOSPHERIC CONCENTRATIONS AND CHEMICAL FINGERPRINTS OF PFAS ASSOCIATED WITH PM$_{10}$ IN LYON CITY CENTER

Type of contract: Doctoral contract (2026-2029)

Start date: October 2026

Location:

- UPVD (Université Perpignan Via Domitia), Perpignan (66)
- INERIS, Verneuil-en-Halatte (60), 40 min north of Paris.

Access: A free private bus ensures the connection between the Creil station and the INERIS site.

Telework: 100 days/year

Contacts for more information:

Alexandre Albinet: alexandre.albinet@ineris.fr
Delphine Raviglione: delphine.raviglione@univ-perp.fr

CONTEXT

The French National Institute for Industrial Environment and Risks (INERIS) is an industrial and commercial public establishment under the aegis of the Ministry of the Environment. The Institute's mission is to contribute to the prevention of risks caused by economic activities to health, environment, and the safety of people and goods.

OBJECTIVES OF THE THESIS

Per- and polyfluoroalkyl substances (PFAS) constitute a large family of fluorinated chemical compounds encompassing thousands of substances that are present in a wide range of consumer products and used in numerous industrial applications. These compounds are found in all environmental compartments, including the atmosphere, and pose risks to human health and ecosystems, notably due to their high persistence. Understanding the temporal evolution of PFAS concentrations and characteristics in ambient air is therefore essential to support the development of appropriate regulatory frameworks for their management. The PFAhiStory project (ADEME, contract no. 2462D0052, 12/2025–05/2029), within which this PhD project is conducted, aims to reconstruct the historical evolution and to analyze long-term trends (January 2015 – May 2027) of atmospheric concentrations and chemical fingerprints of PFAS associated with particulate matter (PM$_{10}$) at a study site representative of population exposure

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www.ineris.fr
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in France (urban site of central Lyon). The project relies on historical PM_{10} filter samples collected through the CARA program (Operational Network for In Situ Observation of PM Chemical Composition and Sources in Urban Environments), coordinated by the French Central Laboratory for Air Quality Monitoring (LCSQA). Within this project, targeted and non-targeted chemical analyses will be performed using liquid chromatography coupled to mass spectrometry (LC-MS). A limitation of high-resolution non-targeted LC-MS (LC-HRMS) is that it allows only a partial coverage of particle-bound compounds, particularly for PFAS, for which only around 10% are amenable using liquid chromatography techniques. To extend the analytical coverage, non-targeted methods based on gas chromatography coupled to high-resolution mass spectrometry (GC-HRMS) are essential complements, especially for the analysis of volatile and semi-volatile PFAS. Furthermore, the use of two-dimensional gas chromatography (GC×GC) significantly improves the separation of these compounds, as well as of other organic compounds associated with PM_{10}. When combined with different ionization modes, this approach provides the broadest possible chemical fingerprints accessible by GC. The objectives of this PhD project are therefore to develop and implement targeted analyses (for specific PFAS not amenable to LC analysis) and non-targeted GC×GC-HRMS analyses across the full set of PM_{10} samples (January 2015 – May 2027). These complementary analyses will enable the digitalization of PM_{10} samples and the generation of the most comprehensive chemical fingerprints possible by combining LC-HRMS and GC×GC-HRMS data. These datasets will be exploitable for the future identification of emerging compounds or compounds of atmospheric interest, particularly PFAS. Atmospheric PFAS concentrations observed in this study will be compared with values reported in the international literature and with data obtained from other projects or studies conducted in France. The added value of combining LC- and GC-based mass spectrometry approaches within the PFAhiStory project and this PhD research will be assessed. Finally, statistical analyses will be carried out to evaluate long-term trends in PFAS concentrations in particulate matter, as well as in PFAS chemical fingerprints present in the particulate phase.

PROFILE

Master's degree in environmental chemistry or analytical chemistry

Experience/Skills

- Strong interest in laboratory work, as well as in data processing and analysis
- Solid background in analytical chemistry (GC-MS, GC-HRMS, GC×GC-MS)
- Experience in data analysis and statistical processing (e.g. R, Python)
- Knowledge of atmospheric chemistry and/or air quality would be an asset
- Ability to work independently, scientific rigor, adaptability, teamwork skills, open-mindedness, strong analytical skills, and good scientific writing abilities
- Good spoken and written English

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GENERAL INFORMATION

Location of the PhD project:

- UPVD – CRIOBE Laboratory (UAR 3278) – MSXM platform (Secondary Metabolites, Xenobiotics and Environmental Metabolomics), Perpignan (66): 1st year of the PhD

- INERIS, Verneuil-en-Halatte (60): 2nd and 3rd years of the PhD

Supervision:

PhD supervisors: Alexandre Albinet (INERIS) and Marie-Virginie Salvia (UPVD-CRIOBE)

Supervisory team members: Nina Huynh (INERIS), Delphine Raviglione (UPVD-CRIOBE-MSXM)

Application procedure:

Applicants should send a CV, cover letter, references, and Master's transcripts to alexandre.albinet@ineris.fr and delphine.raviglione@univ-perp.fr

Additional benefits:

- 18 additional RTT days on top of 31 days of annual paid leave
- Flexible working hours
- On-site staff restaurant (or meal vouchers for sites outside Verneuil)
- Electric vehicle charging stations

This position is open to all applicants, and we are committed to fostering an inclusive and diverse working environment.

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