

Offer -Stage de Master 2 Recherche- Year 2023-2024



Stage title: « Determining the occurrence and vertical profiles of per- and polyfluoroalkyl substances (PFAS) in the French Atlantic coast by sediment core analysis»

Stage context

Per- and polyfluoroalkyl substances (PFAS) are a group of synthetic and toxic compounds used in commercial applications, household products, and industrial processes at planetary scale, and which have caused a global environmental contamination¹. Although PFAS have been reported as widely distributed in oceanic environments^{1,2}, the presence of these persistent chemicals in the sedimentary compartment is very little studied, despite the fundamental role of marine sediments in biogeochemical cycles, being both a compartment of storage of pollutants and the main route of exposure of benthic organisms. Particularly, very few studies exist on PFAS vertical profiles in marine coastal sediments, and these profiles in the French coast are still unexplored. The study of vertical profiles of contaminants in sediment cores represents a unique retrospective environmental approach which allows the elucidation of their emission (sources), patterns and deposition history. Such knowledge would improve our estimates for their past and present environmental loads and predictions of exposure to wildlife and humans. The understanding of historical records is also crucial for evaluating the effectiveness of regulatory actions on environmental contaminants.

Three sediment cores collected during the last sampling campaign performed within the framework of the French Marine Chemical Observation and Monitoring Network (ROCCH) in May 2022 are available for PFAS vertical profile research. The cores have been acquired in North-East Atlantic Ocean (Golfe de Gascogne) in sites under different anthropogenic pressures, sliced and dated. A number of analysis of legacy and emerging organic and inorganic contaminants have been already performed, and PFAS results will complete this multi-contaminant investigation.

Stage objectives & work description

The general stage objective is to quantify PFAS in selected horizons (covering the last 50-100 years) from three sediment cores in order to gain knowledge on historical records and exposure patterns of these persistent chemicals. For that scope, the stagiaire (after appropriate training) will implement an analytical method developed in the Chemical Contamination of Marine Ecosystems Research Unit (CCEM). This laboratory protocol is based on the PFAS quantification by liquid chromatography coupled with mass spectrometry (LC-MS/MS). Dedicated clean labs for trace/-ultra trace HOC analysis from CCEM unit will be used. The stagiaire will be involved in all the steps of the workflow, from sampling pre-treatment to contaminant quantification. On a second stage, more time will be devoted to the data generation, validation, interpretation and reporting.

Candidate profile

We look for a really motivated candidate for environmental chemistry, particularly in the proposed topic, and for the lab work holding a good background on analytical chemistry. A good knowledge of most

common sample extraction and clean-up approaches/methods for environmental analysis of hydrophobic organic contaminants (HOCs) and on chromatography coupled with mass spectrometry, particularly LC-MS, is desirable and will be an asset. Good English knowledge, experience on data treatment and willingness to write scientific documents will be a plus. Note: Possibility to publish the results in a high impact factor international journal.

Host Laboratory

Experimental work will be performed in the labs from the CCEM unit (<https://ccem.ifremer.fr/>), Responsible Emmanuel Ponzevera - IFREMER Atlantic Centre (Nantes).

Stage duration

6 months (Desired start: January 2024)

Supervisor

Javier Castro Jiménez, Researcher CCEM – IFREMER (<https://www.researchgate.net/profile/Javier-Castro-Jimenez/research>). Note: The candidate will also work in close collaboration with laboratory engineers and technicians.

More information and applications (CV+ motivation letter)

Javier.Castro.Jimenez@ifremer.fr

References

- (1) Aminot, Y.; Munsch, C.; Muñoz, G.; Sauvé, S.; Houde, M.; Solé, M. Per- and Polyfluoroalkyl Substances. In *Contaminants of Emerging Concern in the Marine Environment*; Elsevier, 2023; pp 169–228. <https://doi.org/10.1016/B978-0-323-90297-7.00006-8>.
- (2) González-Gaya, B.; Casal, P.; Jurado, E.; Dachs, J.; Jiménez, B. Vertical Transport and Sinks of Perfluoroalkyl Substances in the Global Open Ocean. *Environ. Sci.: Processes Impacts* **2019**, *21* (11), 1957–1969. <https://doi.org/10.1039/C9EM00266A>.