



Practical work/Master thesis

Period: Start: January-February 2024 ; Duration: 5 months
Profile: Biogeochemistry, environmental sciences, modelling
Topic: Reactive transport of pharmaceuticals in surface waters receiving WWTP effluents: insights from a bench-scale river channel experiment
Laboratory: Institut Terre & Environnement de Strasbourg – ITES, France
Contact (send a motivation letter and a CV to): Jérémy Masbou, Assistant Professor ENGEES (Water Management National School) masbou@unistra.fr And Gwenaël Imfeld, Research scientist at CNRS (National Center for Scientific Research) imfeld@unistra.fr

Proposal

We are seeking a highly motivated candidate to contribute to an ongoing study on the fate of micropollutants in surface waters, such as rivers and ponds, within agricultural and urban contexts. This research is being conducted at Earth and Environment Strasbourg (ITES, France, <https://ites.unistra.fr/>). Concentrations and transformations of pharmaceuticals, dissolved organic matter (DOM), and particulate matter (POM) in surface waters exhibit spatial and temporal variability, contingent upon the presence of diffuse or point sources and biogeochemical reactions. The interactions among pharmaceuticals degradation, DOM, and POM concerning the in-situ degradation of organic compounds in surface waters remain substantially unexplored.

This Master internship will focus on the dissipation of sulfamethoxazole, a prominent antibiotic frequently detected in streams receiving effluents from wastewater treatment plants. The study aims to investigate the dissipation of sulfamethoxazole under varying hydro-chemical and hydro-climatic conditions in a bench-scale river channel experiment. Experiment will encompass both sediment and water components, across diverse sulfamethoxazole concentrations, DOM quality, and hydrological scenarios.

Characterization of sulfamethoxazole dissipation in the lab-scale river channels will be undertaken through a multidisciplinary approach. This approach includes the analysis of transformation products and DOM quality in the water and the sediment, isotopic biogeochemistry approach employing stable isotopes ($\delta^{13}\text{C}$, $\delta^{15}\text{N}$, $\delta^{34}\text{S}$), and flow reactive transport (FRT) modelling.

Content of the internship:

- (i) Compilation of the pertinent literature and background information pertaining to the transformation of sulfamethoxazole.
- (ii) Development of the experimental design for a bench-scale river channel experiment.
- (iii) Laboratory procedures:
 - Execution, sampling, and management of the bench-scale river channel experiments.
 - Processing of samples through extraction methods.
 - Analysis and interpretation of the obtained results, encompassing the assessment of transformation products, isotope composition (and dissolved organic matter (DOM)).
- (iv) Integration of the acquired data into an existing Flow Reactive Transport (FRT) model.
- (v) Scientific report and their oral presentation of the experimental results.