# PhD fellow (M/F/X)

## Pesticide Transport and Transformation from Soil to Groundwater using Stable Isotopes

The Earth & Environment Institute (ITES, about 200 collaborators) develops four disciplinary pillars to study the Earth and its surface environment: hydrology, geochemistry, geology and geophysics. ITES conducts lab- and field-scale experiments to study transport of water and contaminants. Our research group focuses on the transport and transformation of pollutants in catchments, soils, and aquifers combining hydrological, microbiological and stable isotope approaches. Research at University of Strasbourg covers all areas of science, and encourages interdisciplinary and international collaborations. Located at the heart of Europe in a trinational region of dynamic economic activity, Strasbourg is a pioneer city in terms of environmental awareness in France, and a very pleasant place to live in.

We are looking for a highly creative, qualified and motivated doctorate-level young scientist, in the context of the ongoing collaborative research project 'TOPENSUZ' on the transport and transformation of pesticides and transformation product from agricultural soil to groundwater, in relation with the nitrogen biogeochemical cycle. The PhD project is coordinated by Earth & Environment Strasbourg (ITES-UMR 7063; https://ites.unistra.fr/) of the University of Strasbourg (https://www.unistra.fr/), in collaboration with IPREM-Pau and Sorbonne University, and funded by the French Rhine-Meuse Water Agency (AERM, https://www.eau-rhin-meuse.fr/).

**Project description**

Little is known about the transformation kinetics and pathways of pesticides, the formation of transformation products, in relation with the nitrogen cycle and the microbial activity in the unsaturated zone, i.e., the portion of the subsurface between the soil and the groundwater table. The project involves (i) the development of *in situ* investigation of pesticide transport and transformation in the non-saturated zone and groundwater from grab and passive sampling; (ii) the acquisition of hydrogeochemical and stable isotope data, i.e., using multi-element compound-specific isotope analysis of pesticides, from laboratory and field studies; (iii) the mechanistic interpretation of pesticide reactive transport and its interplay with the nitrogen cycle, microbial activity and organic matter at different scales from the agricultural soil to the groundwater. The experiment will be conducted in the lab (microcosms and columns studies) and in the field (Alsatian aquifer, about 15 selected wells in contaminated sub-catchments). The successful candidate will help developing conceptual approaches (i.e., mass balances, conceptual schemes, modelling) and new integrative experimental tools (i.e., water/soil sampling in the unsaturated zone, passive sampling) to follow-up and understand transformation processes of problematic pesticides and their transformation products in the unsaturated zone. Work to be performed by the doctoral fellow will include:

- Evaluation of pesticide transformation in soil, unsaturated zone and groundwater in a major aquifer in Alsace (France), including pesticide-sensitive drinking water sub-catchment areas, sampling approaches and chemical analyses
- Application of methods for stable isotope analysis of pesticides in environmental compartments
- Interpretation and prediction of pesticide dissipation processes in relation with the nitrogen cycle and fertilization
- Working collaboratively within a multidisciplinary team and with external partners (IPREM Pau and Sorbonne University)
- Preparing peer-reviewed scientific publications and presentations for scientific conferences.

**Applications will require:**

- A Master degree in environmental sciences, in particular in the field of contaminant hydrogeology or biogeochemistry and/or environmental chemistry within the last 5 years
- Experience in field work, hydro(geo)chemical analysis, analytical chemistry and possibly in isotope analysis
- Good command of the English language (written and oral)
- Proven capacities to report scientific results, at least 1 published or ongoing article in peer-reviewed journals of the field
- Communication skills and an ability to work in an interdisciplinary team with scientists, engineers, and technicians. A demonstrated international research experience is required.
- A working knowledge on application of hydrology/hydrogeology, pollutant transformation, pesticide chemistry, sampling approaches, hydro(geo)logical modelling, stable isotope analysis and/or CSIA will be additional assets.

The position is for 36 months. We offer salary and social benefits according to French public sector regulations (2135€ gross per month). Please submit your application **in one single PDF file**, including a letter of motivation, detailed CV, list of publications, copies of certificates, recommendation letters from at least two referees, a short research proposal (no more than 3 pages, describing scientifically why you are interested in this field and this project, why and how you wish to start the project, and what makes you suitable for the project), publications in support of your application (no more than 3 files), and all other relevant information to the scientific contact, Gwenaël Imfeld (imfeld@unistra.fr), CNRS research Professor at ITES. The title of the application mail should contain 'Application to PhD fellowship in Isotope Studies of Pesticide Transformation from Soil to Aquifer'.

**Closing date for applications is September 15, 2023**. Starting period will be January, 2024.