



POSTDOCTORAL POSITION

Multi-elemental & high frequency hydro-biogeochemical monitoring of headwater ecosystems exposed to agricultural pressures or forestry

The French National Research Institute for Agriculture, Food, and the Environment (INRAE) is a public research establishment. It is a community of 12,000 people with more than 200 research units and 42 experimental units located throughout France. The institute is among the world leaders in agricultural and food sciences, in plant and animal sciences, and is 11th in the world in ecology and environment. INRAE's main goal is to be a key player in the transitions necessary to address major global challenges. In the face of the increase in population, climate change, scarcity of resources and decline in biodiversity, the institute develops solutions for multiperformance agriculture, high quality food and sustainable management of resources and ecosystems.

WORKING ENVIRONMENT AND ACTIVITIES

■ You will be welcomed in the unit **UMR SAS in Rennes** which counts ca. 100 agents (70 permanent/30 non-permanent agents including researchers, professors, lecturers, engineers and technicians) and involved in research on the interactions between agriculture and the environment using an integrative and spatialized approach of rural areas. Our main interests are water, nitrogen carbon and phosphorus cycles in cultivated landscapes. Our research contributes to elaborate sustainable agricultural systems, to improve landscape management to preserve natural resources such as water, soil, atmosphere and landscape quality.

You will contribute to the French CRITEX program (Challenging equipments for the temporal and spatial exploration of the Critical Zone at the catchment scale) and lead a collaborative work between INRAE, CNRS (Centre National de la Recherche Scientifique) and several Universities by working with scientists from the following teams: SAS and [Geosciences Rennes](#) (Rennes), [IPGP](#) (Paris), [HYCAR](#) (Antony), and [LHyGes](#) (Strasbourg). You will be an active member of the French scientific community of Critical Zone Sciences via the national [OZCAR Research Infrastructure](#), part of the European eLTER ESFRI. In particular you will benefit from the experimental settings of **three critical zone observatories**: [AgrHyS](#) (Agricultural catchment; Brittany), [ORACLE](#) (Agricultural catchments in the Paris region), and [OHGE](#) (Forested catchment in the Vosges mountain) that have been equipped with the "RiverLab", a lab-in-the-field instrument measuring the river chemistry continuously at high frequency (≤ 30 minutes).

■ You will be in charge of:

- Contributing to the measurement of water concentration at hourly/sub-hourly resolution using the River Labs prototypes (see below)
- Contributing to analytical and methodological aspects (transfer time estimations, analyzers synchronization, data qualification)
- Developing a generic methodology to combine geogenic, atmospheric and anthropogenic tracers to identify a set of relevant and complementary elements that can be used to infer water sources and pathways (for instance using C-Q relationships). The three catchments present different geological properties (mineralogy, pedology, porosity, permeability...), different land uses and covers (typical of crop-farming systems vs. arable crops landscapes vs. forestry), various topography (plain to middle mountain) and climatic gradient from oceanic to continental. The biogeochemical sources will thus be different from one site to another.
- Analyzing the high-temporal resolution of concentrations data to identify and understand differences in the hydrological behavior between the three catchments using the developed methodology based on multiple tracers. The increased temporal resolution will allow refining our

- understanding of hydrological processes by increasing the number of points on discharge rising limbs and by providing information on the non-stationarity of transit times within catchments.
- Analyzing the diel cycles of biogeochemical elements, interpreting them in regards with biological, hydrological and thermic activities, and describing the seasonal variability of these cycles.
 - Valorizing the results within the academic communities

■ Special conditions of activity: Field missions will therefore be organised on a regular basis in the three sites. The three observatories are equipped with a prototype of in-field laboratory developed in the CRITEX project. These prototypes are located on small stream outlets and equipped for the monitoring of major ions (Na, K, Ca, Mg, Sr, Cl, SO₄, NO₃ by ionic chromatography), of organic carbon (by photochemical oxidation or indirectly by absorbance), dissolved silica (by colorimetry), alkalinity and a set of physico-chemical parameters (T°, pH, O₂, turbidity...). You will interact with the EXTRALAB company, in charge of the maintenance of the three river labs.

TRAINING AND SKILLS REQUIRED

- Recommended training: **Holding a PhD** in geochemistry, biogeosciences, or relevant field **with less than 7 year's research experience after your PhD**
- Knowledge required: **Hydrology, geochemistry, analytical chemistry, modelling or data science.**
- **International experience required:** during or after your PhD, have spent more than 18 month out of France within the last three years
- Skills sought: Excellent **technical and analytical skills in aqueous chemistry** (monitoring of various dissolved or particulate major elements). Academic records. Autonomy, creativity and team spirit. Be willing to **carry out fieldwork** at the observatory sites.

↘ Reception modalities

- Unit: UMR 1069 SAS
- Postal code + city: 35042 Rennes
- Type of contract: Post-doc
- Duration of the contract: 24 months
- Starting date: May 2021
- Remuneration: depending on your experience
2700 – 2900 euros/months

↘ How to apply

Send a motivation letter and a CV to :
Ophelie Fovet and Anne-Catherine Pierson-Wickmann

- By e-mail: ophelie.fovet@inrae.fr ; anne-catherine.pierson-wickmann@univ-rennes1.fr

✘ Deadline for applications: Jan, the 4th, 2020