

CALL FOR PhD CANDIDATES

Thesis in fluvial geomorphology and geochemistry funded by CNRS (France)

Title: Impact of river engineering works on the dynamics and composition of sedimentary transfers and deposits along the Upper Rhine: coupling geomorphological and geochemical approaches

Faculty advisors:

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Background and objective of the thesis:

This project globally aims at reconstructing the spatio-temporal dynamics of sedimentary deposits in the Upper Rhine and their chemical composition in relation to the industrial, agricultural and urban evolution of this region, from the 18th century onwards. It thereby focuses on three main time periods:

1. prior to the engineering works of the Rhine (several centuries);
2. main engineering works during the 19th-20th centuries (e.g. canalization of the river and regional industrialization);
3. modern times, encompassing the closure of the nuclear power plant of Fessenheim.

Based on a combination of geomorphological, sedimentological, geochemical and isotopic tracing approaches, the PhD thesis will contribute to the current efforts to reconstruct the history of the Upper Rhine socio-ecosystem. The coupling of geochemical analyses of the historical sediments of the Rhine with thorough geomorphological, sedimentological and geochronological studies of the paleo-channels, which may have worked as pollutant hotspots, will be a core topic of this project. This will be achieved by mapping the paleo-channels, dating their formation and coring the fluvial deposits to investigate their mineralogical and geochemical characteristics. This interdisciplinary research will also provide major information to establish the current state of the Fessenheim socio-ecosystem and to assess how the closure and dismantling of the nuclear power plant will impact it. It should also lead to operational benefits in terms of river restoration. Finally, this project will contribute developing transposable methodologies to other fluvial contexts.

The first task of the thesis aims at applying and developing geochemical and isotopic tracing approaches to characterize the sources of the various chemical flows in water and Rhine sediments and to uncouple the "natural" flows from anthropogenic-influenced flows (agricultural, industrial, urban...). Different geochemical tracing tools will be used, depending on the types of contaminants to be traced. This work will be based on an initial inventory to define the types of tracers according to the types of pollution/activities (thesis in progress conducted elsewhere). In its initial phase, the PhD student will focus on metal contamination originating by industries, river infrastructures, agriculture and/or urban activities.

The second task is to evaluate how the temporal analysis of the signals recorded in the fluvial landforms and sediments of the Rhine (e.g. palaeochannels by-passed by the Rhine rectification or other floodplain areas) allows reconstructing the past evolution of these contaminations in the hydrosystem. This work will be based on geomorphology (diachronic geomatics analysis, study of longitudinal profiles, LIDAR analysis, etc.) and sedimentology (grain size, etc.) to

draw up a detailed mapping of the Rhine paleo-channels, define the fine chronology of their implementation and select the most relevant ones to core for their mineralogical and geochemical analysis. A new geochronological method with high stratigraphical resolution will be used, in collaboration with the University of Freiburg.

Required skills:

The candidate must have obtained a Master 2 in physical geography, geology, environmental sciences or engineering. Research experience in fluvial geomorphology and geochemistry would be appreciated. He/she must be part of a multidisciplinary research team composed of geographers, hydrogeochemists, geochronologists, lawyers and economists and must therefore show an interest in interdisciplinary research.

Location, remuneration:

France, Strasbourg, Laboratories LIVE et LHYGES (Central Campus of University of Strasbourg).

Doctoral School: "Sciences de la Terre et de l'Environnement" (n° 413).

Affiliation: University of Strasbourg.

Type of position and salary: CNRS fixed-term contract (CNRS doctoral contract) of 3 years for a gross monthly salary of 2135 €, or 1683 € net/month (including social security).

Environmental costs of the thesis: the thesis will be integrated into the IDEX Juxta Rhenum project of the University of Strasbourg (2018-2019) and the Observatoire Homme Milieu (OHM) Fessenheim (2019-2026; CNRS). It will be able to benefit from financial support from these research structures.

How to Apply?

The candidate must send by **May, 30 2019 (24:00)** at the latest a letter of motivation and a detailed CV, as well as the names and addresses of two scientific references (possibility of also sending letters of recommendation), to Laurent Schmitt - laurent.schmitt@unistra.fr and/or François Chabaux - fchabaux@unistra.fr . Laurent Schmitt and François Chabaux will be able to provide additional information on the project of the thesis if necessary and may ask to candidates some complementary information.

An interview of the selected candidates after examination of the letters of motivation and CV will take place in Strasbourg on Friday **June, 6 2019 (morning)**.