Universität Stuttgart

IWS Department of Hydraulic Engineering
and Water Resources Management
Prof. Dr.-Ing. Silke Wieprecht

B.Sc./M.Sc. Topic

"Understanding the dynamics of the hyporheic zone in the Upper Isar, Bavaria"

**Understanding the dynamics of the hyporheic zone in the Upper Isar, Bavaria**

Background

Enhancing the understanding of the interactions between hydraulic conductivity and oxygen dynamics in riverbeds is key to characterizing habitat conditions, defining metabolic rates of organisms, and establishing target conditions for restoration actions in different types of morphological patterns. In this thesis, field measurements collected in the upper Isar River, Bavaria, provide a unique dataset capturing vertical hydrological connectivity between surface water and the hyporheic zone. Notably, the hyporheic zone is a subsurface transition zone where surface water mixes with groundwater, which plays a key role for the ecological processes in river ecosystems. This thesis involves post-processing of and gaining insights from the collected field data, including hydraulic conductivity tests (slurping tests), dissolved oxygen measurements (with optodes), porewater temperature, and pH. The primary objective is to characterize the spatial and temporal variability of hydraulic conductivity and oxygen concentrations. Post-processing methods embrace statistical analyses, identifying correlations between measured variables, offering insights into potential hyporheic exchange processes and biogeochemical cycling. For a Master's Thesis, a comparative analysis with existing datasets from other, heavily modified rivers (e.g., Rhine and Inn) will be additionally conducted to investigate the impacts of lateral confinement and coarse sediment scarcity on fluvial environments. The outcomes will provide scientific contributions for river management and restoration strategies, addressing the biodiversity crisis.
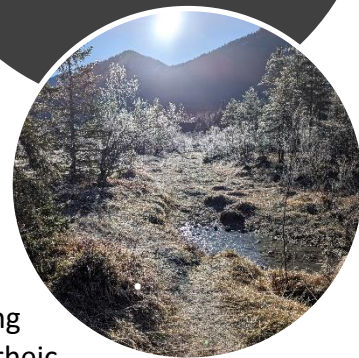
Thesis Overview

1. Complete a literature review on hyporheic variables and relevant processes.
2. Perform data post-processing and statistical analyses, and (for a M.Sc. Thesis) comparisons with available datasets obtained in other rivers.
3. Characterize hyporheic dynamics of morphological patterns in the investigated river reach.

Desirable Skills

- Basic knowledge of hydraulic engineering (Wasserbau an Flüssen und Kanälen (BAU), Gewässerkunde und Gewässernutzung (UMW), or Hydraulic Structures (WAREM))
- Knowledge in Python is of advantage

Apply now!

Please send a few lines on why you would like to work on this topic:
beatriz.negreiros@iws.uni-stuttgart.de
sebastian.schwindt@iws.uni-stuttgart.de

Examiner: Prof.-Ing Silke Wieprecht| Supervisors: Beatriz Negreiros, MSc. (Universität Stuttgart)

Dr. sc. Sebastian Schwindt (Universität Stuttgart)