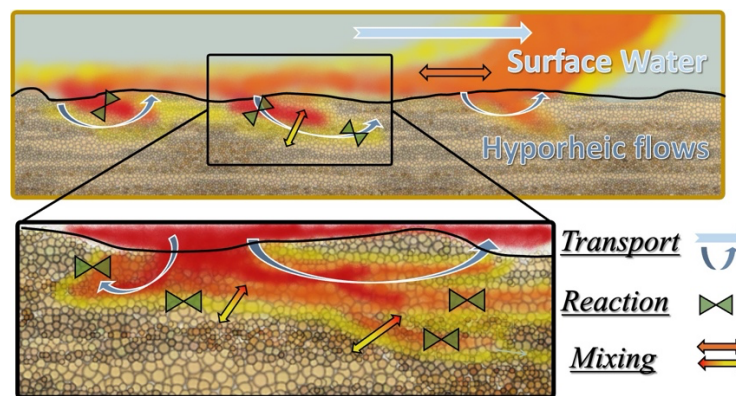


PhD position

Unrevealing the role of the hyporheic zone in rivers: Upscaling transport dynamics

Job description

The Department of Civil and Environmental Engineering (DICA) at Politecnico di Milano invites applications for a postdoctoral position to study solute transport dynamics taking place in the hyporheic zone. The position is a part of the ERC Starting Grant project 'The role of the HYPORheic zone on the transporter-transformer functions of River corridors' - [HYPOR](#).



Reactive substances transported in river corridors undergo several transformations having important implications for the fate of toxic chemicals and the health of fluvial ecosystems. Delivery of substances into the slow and geochemically-microbially rich hyporheic zone delays their downstream transport and promotes opportunities for biogeochemical reactions. The resulting delay and reactivity at larger scales are shaped by the ubiquitous heterogeneity of environmental porous media and the temporal fluctuations that typify river corridors which control transport and mixing limitations in the reactive regions of the hyporheic zone. **HYPOR** overarching goal is to ground the upscaling of reactive-transport in river corridors on the mechanistic knowledge of the hyporheic dynamics, mitigating the uncertainty on predictions.

In the context of the project, the candidate will develop upscaled descriptions of the transport, mixing and reactive dynamics linked to the mechanisms and features that govern large-scale behaviors. In particular, the upscaled models will be linked to (a) heterogeneities in the hydraulic (e.g., in the sediment permeability) and biogeochemical (e.g., in the reaction rates) properties of the hyporheic zone and (b) temporal fluctuations in the fluvial-aquifer regime. While the focus is on the theoretical development of upscaled descriptions, the candidate will interact with other HYPOR research team regarding the numerical simulations and experimental data. Visiting period to international collaborators will be strongly encouraged. Results will be published in international scientific journals, newsletters, and social media outlets, and the work will be presented at international conferences and project meetings.

Candidate Profile

The following qualification and skills will be valued:

- Master degree in Physics, Engineering, Applied Mathematics, or similar
- Knowledge in stochastic methods and transport in disordered media
- Knowledge and skills in numerical methods and scientific programming
- Interested in collaborative multi-disciplinary research
- Proficient with English

Institution and Research Group

[Politecnico di Milano](#) is ranked first among the universities in Italy and among the 20 first for Civil and Structural Engineering globally. It is the host institution for more than 50 projects founded by ERC with 25 founded in the Horizon Europe programme. Politecnico di Milano puts at disposal licenses for major scientific-oriented software.

[DICA](#) promotes the transversality between the disciplines characterizing Civil and Environmental Engineering, allowing to face the problems of the sector with an integrated approach. DICA operates on geology, hydraulics, hydrology, water resources management, hydraulic and maritime constructions among others. The Hydraulic Engineering section at DICA focuses on the analysis of river flow dynamics, computational fluid dynamics, subsurface flow and transport and uncertainty quantification blending experimental, numerical and theoretical developments fostered by extensive and consolidated national and international networks.

[MIPORE](#) is an interdepartmental research group based at the Department of Civil and Environmental Engineering and at the Department of Energy at Politecnico di Milano, Italy. MIPORE works on theoretical, computational, and experimental approaches for the characterization of porous materials across a wide range of applications and scales. The research activities include the dynamic characterization and modelling of multi-scale reactive transport focusing on upscaling techniques and uncertainty quantification.

Conditions of Employment

- **Annual gross-salary:** approximately 28'000 €
- **Full-time** position
- **Starting date:** flexible (preferred 1st February 2025)
- **Duration:** 2 years (with possibility of extension)

Application

If you meet the qualification criteria, you are requested to provide the following documents:

- Letter stating your motivation to apply and your key relevant qualities for this position
- Up-to-date Curriculum Vitae
- Contact information of two academic references

The Politecnico di Milano values diversity and is committed to providing equal-opportunity employment. Please submit your application no later than April 30, 2025.

Contact

To submit your application or further information, please send an email **with the subject** **ERC HYPOR Position PhD2** to Aronne Dell'Oca at the mailing address aronne.delloca@polimi.it