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PhD position: Upscaling transport processes in partially-saturated porous media

Job description

The Spanish National Research Council (IDAEA–CSIC, Barcelona) invites applications for a PhD position to study multiphase flow and hydrodynamic transport in permeable media. The position is part of the ERC Starting Grant project **Uplift**.

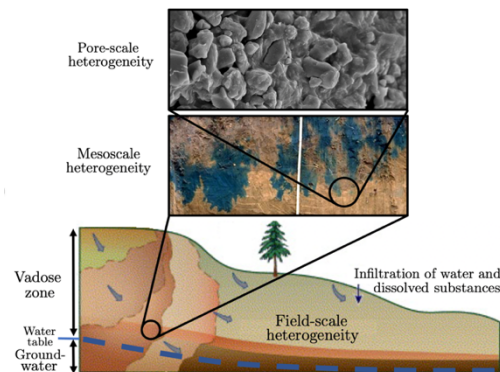


Figure sources: Top: lsu.edu/science/geology. Middle: Dye injection courtesy of T. Gimmi, ETH Zürich. Bottom: Adapted from Steefel *et al.*, *EPL*, 2005.

The overarching goal of **Uplift** is to develop upscaled models for transport, mixing, and reaction in the vadose zone, rooted in a firm understanding of pore-scale dynamics. The vadose zone is the unsaturated region connecting the land surface to groundwater, acting as a filter for nutrients and contaminants and controlling their access to aquifers. Reactive transport in partially-saturated porous media is of central importance to our understanding of nutrient cycles and applications such as soil and groundwater remediation. Geological media are heterogeneous across scales, and the simultaneous presence of air and water enhances structural heterogeneity. Understanding and predicting reactive transport processes requires a better understanding of pore-scale dynamics under partially-saturated conditions, along with a theoretical framework capable of capturing their impact at larger scales.

In the context of the project, the candidate will develop stochastic models for the transport and mixing of dissolved substances in heterogeneous, partially-saturated porous media. In order for these models to be predictive, the impact of saturation degree on point velocity statistics and their correlation structure will be studied under a wide range of medium structures and flow conditions. While the main focus of the position is the development of theoretical models, the candidate will also be involved in the associated numerical modeling and interact with the **Uplift** research team and collaborators regarding numerical and experimental data. 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. The candidate will pursue his PhD as part of an interdisciplinary team at the IDAEA–CSIC.

Candidate profile

The following qualifications and skills will be valued:

- Master's degree in Physics, Engineering, Applied Mathematics, or similar
- Theoretical background in stochastic modeling and transport processes
- Knowledge and skills in numerical methods and scientific programming, preferably C++
- Interest in collaborative multi-disciplinary research
- Proficiency with English

Institute of Environmental
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Organization

The **Institute of Environmental Assessment and Water Research (IDAEA)** of the Spanish National Research Council (CSIC), is currently a Severo Ochoa Center of Excellence. The CSIC is the largest public research organization in Spain, and the third largest in Europe. The Institute is devoted to the study of the human footprint on the biosphere. The IDAEA is strongly multidisciplinary, with researchers from engineering, physics, environmental, geological, and chemical sciences. The candidate will integrate the Uplift project's research team, led by the supervisor.

Conditions of Employment

- **Annual gross salary:** ~€39 000 (standard Spanish FC3 contract)
- **Full-time** position
- **Preferred starting date:** 1 April 2024
- **Duration:** 3 years

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 CSIC values diversity and is committed to providing equal-opportunity employment.

Please submit your application no later than **March 31, 2024**.

Contact

To submit your application or ask for more information, please send an **email with the subject ERC Uplift Position PhD1** to:

- Tomás Aquino, Permanent Researcher at IDAEA–CSIC: tomas.aquino@idaea.csic.es