

# Post-doc position on multiphase porous media at Westlake University

This is post-doc position in the Key Laboratory of Coastal Environment and Resources of Zhejiang Province for a joint project that involves Ling Li's lab, Sergio Andres Galindo Torres's lab and Liang Lei's lab.

## Introduction of the Key Lab

Key Laboratory of Coastal Environment and Resources of Zhejiang Province (KLaCER) was established in 2021 with strong support from the provincial Science and Technology Agency. KLaCER endeavors to advance our understanding of the coupling mechanisms of land-ocean-atmosphere interactions that underlie various eco-environmental and resource utilization problems in the coastal zone, and to develop innovative methodologies and techniques to tackle these problems. The main research objectives are to (1) Discover and understand land-ocean-atmosphere interactions in the coastal zone; (2) Develop sustainable technologies for coastal pollution control and ecological restoration; (3) Explore and develop marine resources. KLaCER aims to become a world-leading center of excellence in coastal zone research, providing strong scientific and technological support for solving the eco-environmental and resource utilization problems in coastal zones in Zhejiang Province, China, and other parts of the world.



School of Engineering at Yungu Campus of Westlake University

## Introduction of the collaboration groups

Professor Li's principal research interests lie in mathematical modelling of complex environmental systems. His works address fundamental aspects of ocean-land interactions and have contributed to the development of many emerging concepts and research directions in this field. He developed the first theoretical model of submarine groundwater discharge (SGD) that incorporates oscillating groundwater flow and circulation driven by tides and waves. The

ocean-land interface is a critical zone of the earth system. Coastal wetlands, for example, play important roles in moderating green-house gas emission and protecting the coastal zone from impacts of sea level rise. Professor Li's research has improved significantly our understanding of complex eco-environmental system at the ocean-land interface. He was awarded an Early Career Researcher Award by Australian Research Council, National Natural Science Award of China (2nd Class), Natural Science Award of Ministry of Education of China (1st Class) and National Science Fund for Distinguished Young Scholars from National Natural Science Foundation of China. Professor Li's research interests also cover broadly the areas of eco-hydrology, multi-scale multiphase porous media flow and transport processes with hydro-mechanical coupling, eco-environmental system modelling, environmental pollution and control, impact of major engineering projects on the environment and global changes.

Dr. Galindo Torres's research deals with the multi-scale analysis of complex processes found in disciplines such as Civil, Mining and Environmental Engineering. Its focus is to find the connection between the physics that happens at the microscale (interactions between soil grains, water droplets, air and gas bubbles) and the field scale behaviour. To achieve this goal, experiments, numerical simulations (using techniques such as computational fluid dynamics) and theoretical developments, coming from statistical physics are combined, to gain further understanding and predictability of these challenging problems. Dr. Galindo Torres research has created an impact beyond the academy, by working in research projects with industry partners such as Golder Associates Ltd and Newcrest Mining Ltd.

Dr. Lei's research on porous media features temperature, pressure and stress control, pore-scale insights based on micro-CT technique integrated with conventional testing, multi-physics experiments and theoretical analysis. Targeted areas include: (1) particulate material and porous media under abnormal conditions and their interaction with pore constituents; (2) energy, marine, and resource geo-engineering; (3) permafrost and outer space sediments; (4) natural gas hydrates and their hosting sediments; (5) massive energy storage; and (6) multi-phase flow and crystallization in porous media.

Website of Eco-Environmental Research Laboratory: <https://lll.westlake.edu.cn/>

Professor Li's webpage:

[https://en-soe.westlake.edu.cn/OurSchool/Faculty/PI/201912/t20191215\\_2874.shtml](https://en-soe.westlake.edu.cn/OurSchool/Faculty/PI/201912/t20191215_2874.shtml)

Multi-scale Multi-physics Modelling (M3) Lab: <https://m3.westlake.edu.cn/>

Dr. Galindo Torres's webpage:

[https://en-soe.westlake.edu.cn/OurSchool/Faculty/PI/201912/t20191206\\_2506.shtml](https://en-soe.westlake.edu.cn/OurSchool/Faculty/PI/201912/t20191206_2506.shtml)

Website of Digital Porous Media Laboratory: [dpml.westlake.edu.cn](http://dpml.westlake.edu.cn)

Dr. Lei's webpage:

[https://en-soe.westlake.edu.cn/OurSchool/Faculty/PI/202006/t20200611\\_3903.shtml](https://en-soe.westlake.edu.cn/OurSchool/Faculty/PI/202006/t20200611_3903.shtml)

## **Job Description**

Position: Postdoctoral fellow (1) in Key Laboratory of Coastal Environment and Resources of Zhejiang Province (KLaCER)

This position is for an exciting joint project dealing with the complex physics of porous media involving different phases: ice, water, gas and solid grains. The position involves support from the KLaCER as well as 3 distinct research groups in terms of state-of-the-art experimental equipment, simulation software developed in house and ample experience in the modelling and interpretation of data. Some open questions to be explored during this project are: i) How to properly characterize multiphase flow in porous media, including how to properly define quantities such as permeability, in complex cases; ii) A thorough study on the phase transition thermodynamics of ice/liquid water/vapor inside porous media, including an exploration on how the critical temperature is affected by the pore structure; and iii) Deformation/rheology of porous media hosting more than one fluid (e.g., gassy soil or unsaturated soil), including how the porous media interacts with different pore fluids. Giving the broad reach of this project, individual postdocs can choose their own sub project according to their research preferences and capabilities. Due to the multidisciplinary nature of this project, applicants from a broad selection of disciplines are invited to apply with a preference given to the following backgrounds: civil or environmental engineering, mechanics and physics. This is an ambitious project offering significant training opportunities for newly graduated PhDs with significant professional growth potential.

Requirements:

- 1) Have obtained or expect to obtain shortly the PhD degree,
- 2) Age under 35,
- 3) Good track academic record.

## **Compensation and Benefits**

The research team offers a competitive compensation package commensurate with the selected candidate's qualifications and experience. Offer matching could be considered.

Post-doc(s) who are selected for China Postdoctoral Science Foundation or Advanced Programs of Zhejiang Province will be entitled to receive the same amount funds from the Hangzhou government.

Post-doc(s) who work full-time in Hangzhou after completing their post-doc research will be eligible for applying allowance of 400,000RMB from the Hangzhou government.

## **How to Apply**

To apply, please send resume, representative papers and any other relevant materials as PDF files to [leiliang@westlake.edu.cn](mailto:leiliang@westlake.edu.cn) and cc [liling@westlake.edu.cn](mailto:liling@westlake.edu.cn) and [s.torres@westlake.edu.cn](mailto:s.torres@westlake.edu.cn), and indicate the Post-doc application in the subject.

