



# UNIVERSITÀ DEGLI STUDI DI MILANO

## Corso di Dottorato in Scienze della Terra

Dipartimento di Eccellenza 2023-2027  
LE GEORISORSE PER LA TRANSIZIONE ECOLOGICA  
E LO SVILUPPO TERRITORIALE



9<sup>th</sup> July 2024, 11:00 CET - Seminar (1 hour) – Room “A” (also [online](#))  
Dipartimento di Scienze della Terra “A. Desio”, via Mangiagalli 34, Milano

### ENVIRONMENTAL GEOMECHANICS: TOWARDS A MINIMISED CHEMICAL FOOTPRINT IN GEO-ENERGY ENGINEERING by Man-Man HU

- Multi-scale chemo-mechanical modelling
- Enhanced crack propagation in geomaterials
- Application to
  - Carbon Capture Utilisation and Storage (CCUS)
  - enhanced geothermal systems (EGS)
  - Hydrogen Storage



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To join online, click [here](#)

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# Course description and schedule

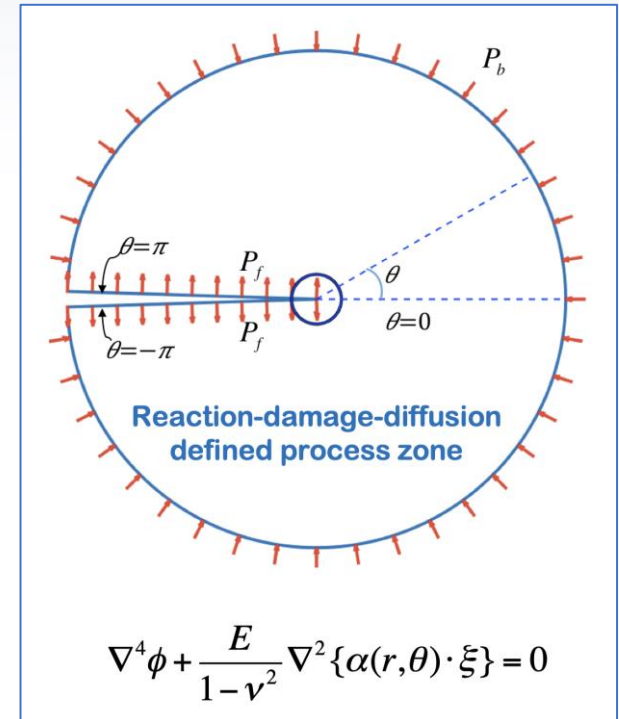


## Abstract:

Cracking is ubiquitous in a geomaterial when it is subject to an environmental perturbation. Controlling environmentally assisted subcritical crack growth is considered as the key enabler to a safe and active geo-energy adaptation to Climate Change, particularly in the emerging areas of unconventional shale hydrocarbon recovery, Carbon Capture Utilisation and Storage (CCUS), enhanced geothermal systems (EGS) as well as Hydrogen Storage. The common feature of these applications is aiming to achieve an enhanced permeability and injectivity in the target formation by the stimulation of hydraulic fracturing. In order to maximize the effectiveness of the technique and meanwhile limit the extent of chemical footprint, a sophisticated understanding of the feedback between the mechanics of a geomaterial and the surrounding environment it is subject to is required. In this talk, modelling approaches on the effect of chemical environment on subcritical cracking in a stressed geomaterial undergoing mineral dissolution at multiple scales will be presented. The coupling between chemical mass removal and geomaterial degradation in the context of enhanced crack propagation is assessed through a reactive chemo-plasticity framework, and a newly proposed chemo-elasticity model extending the Airy stress function into the chemical domain. Future direction on an alternative non-destructive shear stimulation from the perspective of material bifurcation will also be presented.

## About the speaker:

Dr. M.M. Hu is currently an Assistant Professor in the Department of Civil Engineering, The University of Hong Kong. Dr. M.M. Hu holds a Ph.D degree in Geomechanics from Duke University (USA) and a B.Eng degree from Zhejiang University (China). Prior to joining HKU, Dr. Hu worked as Vice Chancellor's Research Fellow on the strategic priority of Unconventional Resources at UNSW Sydney (Australia). Dr. Hu's research work emphasizes on the interdisciplinary field of environmental geomechanics driven by modern-day geo-engineering activities and fundamental understandings of geomaterial behavior in response to environmental perturbations of many sorts. Her current research group focuses on tackling the fundamental Multiphysics processes in Geo-energy and Geo-environment problems, involving coupled Thermo-Hydro-(bio)Chemo-Mechanics in geomaterials and geo-processes across scales.



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