FALL 2024 PETEROLEUM ENGINEERING SEMINAR SERIES

Class Venue: EN305 | October, 23 2024 | 4:30 - 5:20 p.m.

Mengsu Hu, Ph.D.

Dr. Mengsu Hu is a Research Scientist at the Lawrence Berkeley National Laboratory (LBNL). Her research focuses on multiscale numerical modeling and machine learning for analyzing coupled thermal-hydro-mechanical-chemical (THMC) processes, with applications ranging from fundamental Earth science to subsurface engineering systems (e.g., nuclear waste disposal, geothermal energy, and geologic hydrogen production and storage). Her numerical approaches have been applied to solve a range of coupled process problems in fundamental and applied geosciences programs.
She has raised funding for and led several Department of Energy (DOE) multidisciplinary and multi-PI projects. Dr. Hu was one of the founding co-chairs of the CouFrac conferences. Currently, Dr. Hu is serving on the Board of Directors of the American Rock Mechanics Association (ARMA). She has been invited to serve on the Editorial Board for Rock Mechanics and Rock Engineering (Associate Editor), PNAS Nexus of the National Academy of Sciences (NAS), International Journal of Rock Mechanics and Mining Sciences, and Geomechanics and Geophysics for Geo-Energy and Geo-Resources. In 2022, Dr. Hu was selected as a participant of the National Academy of Engineering (NAE) U.S. Frontiers of Engineering symposium.

Multiscale Modeling of Shearing and Coupled Processes in Fractured Rocks

Fractures are key features that control the permeability and seismic stability in subsurface energy geosciences. Fractures may be propagated, altered, sealed, or healed due to a series of coupled processes that may include shearing, chemical reaction (e.g., mineral dissolution and precipitation), and pressure solution (a chemo-mechanical process). In this talk, we will present some of our modeling capabilities and provide examples that answer the following two scientific questions: (1) At different scales, how do geometric features (e.g., asperities of single fractures and intersections of discrete fractures) affect shearing, deformation, fluid flow and chemical reaction? (2) How do we quantify the microscale interplay between the evolving geometric features and coupled chemo-mechanical processes that can explain the time-dependent changes of permeability and friction in fractures? Through these examples, we will highlight the importance of properly addressing complex fracture geometry at multiple scales and the differing coupled processes to understand and control fractured Earth systems.

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