

PHASE-FIELD MODELING OF GEOLOGIC FRACTURES

Speaker

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Abstract

Geologic fractures, such as joints and faults, govern the stability and performance of many natural and engineered subsurface systems. Accordingly, a variety of computational approaches have been developed to model geologic fractures. Yet many of these approaches do not lend themselves to straightforward implementation within the standard finite element method widely used in practice, because they require explicit representation of fracture geometry, specialized discretizations, and/or surface-tracking algorithms. Over the past decade, phase-field modeling has emerged as an attractive alternative because it can simulate complex and evolving fractures using standard finite element machinery, without explicitly tracking fracture surfaces. Standard phase-field formulations, however, do not capture several characteristics central to geologic fractures, including frictional contact, pressure-dependent strength, quasi-brittle behavior, mixed-mode fracture, and surface roughness. This seminar presents a family of phase-field models developed to incorporate these distinct characteristics and their interactions. Through applications to rock fractures, joints, and faults, the seminar also demonstrates how phase-field modeling can provide insights into geologic fracturing processes that are difficult to investigate experimentally.

Biography

Jinhyun Choo is an Associate Professor of Civil, Urban and Environmental Engineering at Seoul National University (SNU). He received his B.S. and M.S. degrees from SNU and, as a Fulbright Scholar, earned his Ph.D. from Stanford University, followed by postdoctoral research at Columbia University. Before returning to SNU, he held faculty positions at The University of Hong Kong (HKU) and the Korea Advanced Institute of Science and Technology (KAIST). His research focuses on the mechanics and multiphysics of geomaterials and their interactions with natural and engineered systems, integrating physics-based modeling, computational methods, experimental techniques, and artificial intelligence. He serves on the editorial boards of leading international journals and is a core member of the ISSMGE Technical Committee on Geomechanics from Micro to Macro. He is also an elected member of the Young Korean Academy of Science (Y-KAST) and Technology and a recipient of the APACM Young Investigator Award.

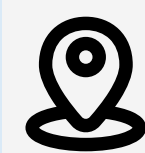


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