ISRM

International Society for Rock Mechanics and Rock Engineering

ISRM YOUNG MEMBERS' SEMINAR SERIES

Development of coupled thermal-hydraulic-mechanical-chemical (THMC) models for predicting rock permeability change

Dr. Sho Ogata(Japan)

Comprehensive in-situ stress estimation for a fractured geothermal reservoir from drilling, hydraulic stimulations, and induced seismicity

Dr. Sehyeok Park(South Korea)

23rd February 2022 (08:00 GMT)

Free subscription under:

https://zoom.us/meeting/register/tJMoceyspzMuHdZeKZhGcBPH8JYejYIElsff

Also available on ISRM YMs' YouTube Channel:

https://www.youtube.com/channel/UCN8FiYOH6LvUMBd9t5uLOyg

Upcoming session:

March 2022

Numerical modelling of rock masses in block cave mining
Dr. Kimie Suzuki(Chile)

Strategy and tactics for burst-prone conditions in underground mining
Dr. Alexander Ramos(Peru)

This event is in collaboration with:

JSRM

Japanese Society for Rock Mechanics

e-mail contact: isrm.ym.seminar@gmail.com

Development of coupled thermal-hydraulic-mechanical-chemical (THMC) models for predicting rock permeability change

Abstract

When evaluating the performance of a geological disposal facility for high-level radioactive waste (HLW), it is significantly important to predict the long-term permeability alteration of host rocks induced by coupled thermal-hydraulic-mechanical-chemical (THMC) phenomena. Among the coupled phenomena, especially, both the fracture generation and the subsequent geochemical creep such as the pressure solution may strongly control the permeability evolution. In order to simulate these key factors, we have presented a coupled numerical model by incorporating the damage effect into the coupled THMC process. Then, the presented model was applied to the long-term prediction of rock permeability within the virtual geological repository of HLW. The predicted results showed that numerous fractures generated during the excavation of disposal cavity enhanced the permeability near the cavity, and afterwards the permeability of the fractured zone gradually decreased with time due to the influence of pressure solution.

Speaker

Dr. Sho Ogata is currently working as an Assistant Professor at Division of Global Architecture, Graduate School of Engineering, Osaka University. Sho Ogata holds a MSc in Civil and Environmental Engineering from Ehime University, and a Ph.D. in Urban Management from Kyoto University, Japan. His research focuses mostly on the numerical modeling of coupled thermal-hydraulic-mechanical damage-chemical process within fractured rock.

Comprehensive in-situ stress estimation for a fractured geothermal reservoir from drilling, hydraulic stimulations, and induced seismicity

Abstract

In November 2017, a Mw 5.5 earthquake occurred in vicinity of the geothermal development site in Pohang, South Korea. The Korean government-appointed investigation commission concluded that the earthquake was affected by a series of hydraulic stimulations conducted at the geothermal development site. In spite of its critical importance, the previously suggested stress models for the Pohang geothermal site had large discrepancies, based on limited number and types of stress-indicating data and each different stress estimation approach. In this study, a comprehensive in-situ stress estimation was conducted for the target depth of the enhanced geothermal system development site in Pohang, South Korea, based on variety of direct and indirect in-situ stress indicators collected from drilling, logging, hydraulic stimulations, and induced seismicity data. The stress magnitudes and orientations are suggested as well as the possible range of friction coefficient of the dominant fault structures at the site. The stress model of this study well explains the characteristics of the Pohang earthquake in terms of reproducing the slip direction and the slip tendency of the mainshock fault, and can be used for various studies clarifying the causal mechanism of the Pohang earthquake, thus providing an insight for fault stability analysis and geo-energy development applications in the southeastern part of the Korean Peninsula.

Speaker

Dr. Sehyeok Park is a Senior Researcher in Korea Institute of Geosciences and Mineral Resources (KIGAM). His research interests include hydro-mechanical behaviors of fractured rock, reservoir hydraulic stimulation, induced seismicity, in-situ stress estimation, 3D geological modelling, and geological disposal of radioactive waste. He earned his Ph.D. in Energy Resources Engineering at Seoul National University in 2021. During his graduate study, he participated in the research projects on geomechanics simulator development, enhanced geothermal site development, and Korea-Europe collaborative research on the demonstration of geothermal well stimulation.