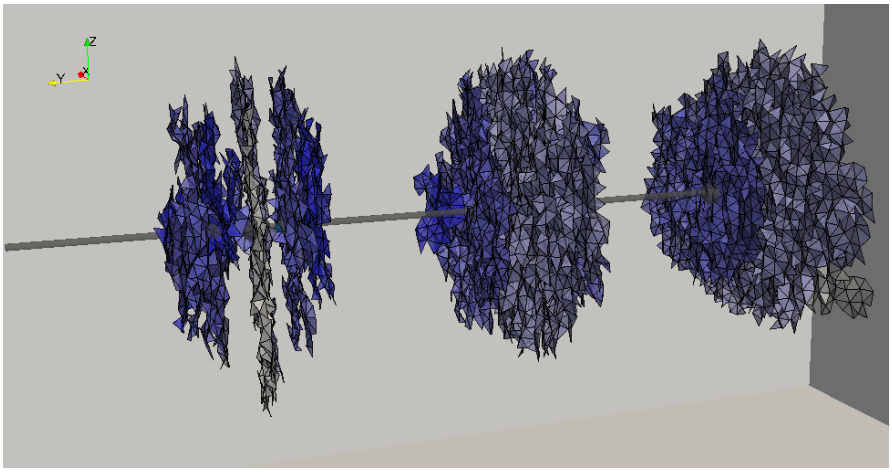
GEOMECHANICA

2D and 3D Modeling of Rock Fracturing Processes in Geomechanics

This hands-on short course covers:

- Numerical modeling of complex, non-linear, coupled rock engineering problems
- Simulation of rock fracture and fragmentation in 2D and 3D
- Coupled THM effects
- Rock support
- Fundamental principles of the state-of-the-art **Irazu** finite-discrete element software
- Hands-on **Irazu** tutorials

Get a free full-featured demo version of Geomechanica's flagship Irazu software!

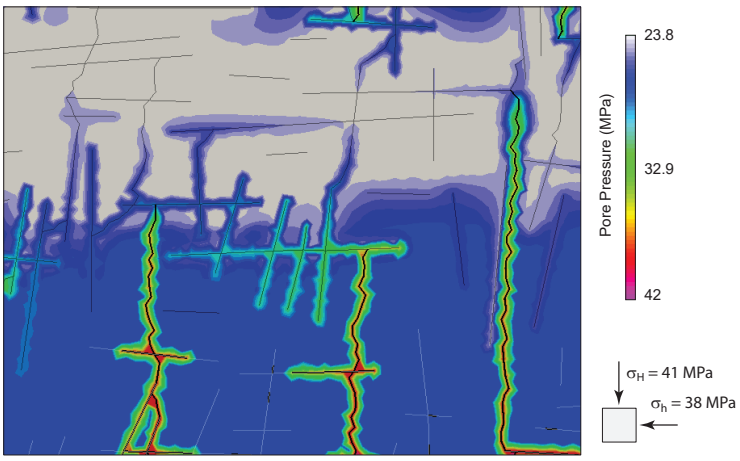


Case study: 3D simulation of multi-stage hydraulic fracturing

Course Description

The finite-discrete element method (FDEM) is a numerical approach that combines continuum mechanics principles with discrete element algorithms to simulate multiple interacting deformable and fracturing bodies. With its ability to qualitatively and quantitatively reproduce failure processes in brittle materials, FDEM is gaining increasing acceptance in civil, mining, and petroleum engineering applications, where fracture and fragmentation processes are key to fully understanding the rock mass behaviour. Geomechanica's *Irazu* software is a GPU-accelerated, thermo-hydro-mechanically coupled, FDEM-based modelling package capable of simulating the interaction between new fractures and pre-existing rock mass discontinuities in 2 and 3 dimensions.

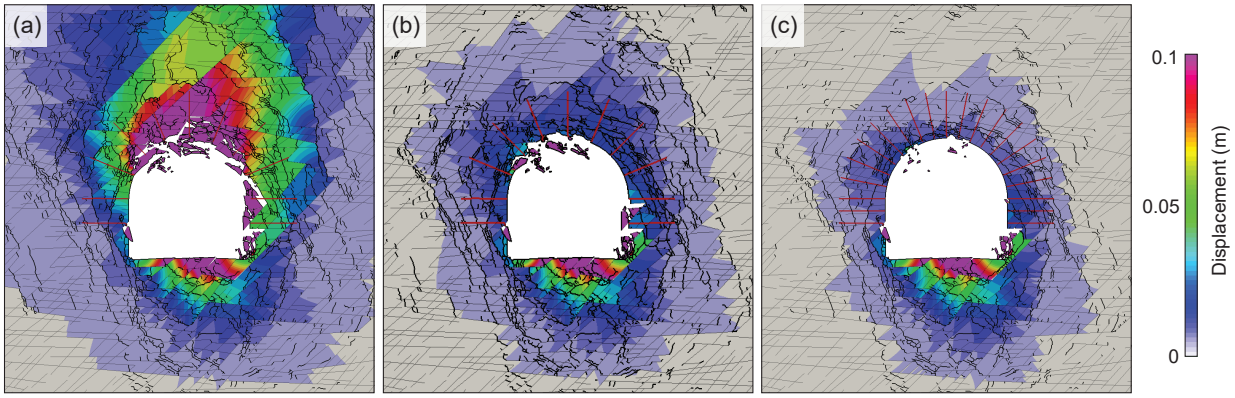
This one-day course will combine theoretical lectures on the fundamental principles of FDEM with practical modeling sessions where participants will be guided through several simulation cases. The course will start with a general introduction to the FDEM modelling philosophy and its application to engineering geology, rock mechanics, and geophysics problems. After a quick review of the basic algorithms, such as finite element deformation, contact detection, and contact interaction, the fracture model will be discussed in more depth. More advanced features of Irazu, including: in-situ stress initialization, rock excavation, and Discrete Fracture Networks (DFNs), thermo-hydro-mechanical coupling, and rock support will also be introduced. In the second part of the course, participants will gain valuable hands-on experience through a series of practical modelling exercises using Geomechanica's Irazu software to model practical rock fracturing problems.



Case study: simulation of hydraulic fracturing and well interaction

Course Objectives

By attending this short course, participants will learn the basic concepts and algorithms embedded into FDEM and how to work with it. Attendees will leave the course with a basic understanding



Case study: effect of rockbolt spacing on fracture development around an underground excavation

of the FDEM simulation approach, its strengths, limitations, and how it can be applied to model complex engineering problems, such as underground excavations in discontinuous rock masses and hydraulic fracturing in unconventional plays. Participants will learn how to build FDEM models in Geomechanica's Irazu software, including the assignment of correct input parameters, and post-processing of the results.

Target Audience

This one-day course is specifically designed for geotechnical, geological, mining and petroleum engineers, as well as undergraduate and post-graduate students and researchers. In particular, anyone who wishes to use or is considering using FDEM to tackle challenging rock mechanics problems would benefit from this course.

Provided Materials

The short course organizer will provide each participant with: (i) electronic copies of the course slides, (ii) electronic copies of the Irazu software manual and tutorials, and (iii) a **free, full-featured demo version of the Irazu software**.

Company Profile and Instructors

Geomechanica Inc. is an engineering company that develops simulation software and provides simulation-aided, technical consulting and laboratory testing services for rock engineering applications in the civil, mining, petroleum, and nuclear waste disposal industries. Our mission is to solve challenging rock mechanics problems via the adoption of state-of-the-art, physically-sound computer simulation methods (Irazu). Geomechanica strives to provide innovative solutions to

complex design and analysis problems with its interdisciplinary team of engineers, scientists, and mathematicians.

Bryan Tatone is the laboratory testing lead and a co-founder of Geomechanica. In addition to laboratory testing, his technical interests include numerical simulation of a variety of rock mechanics and rock engineering problems. He is the recipient of the 2017 Rocha Medal of the ISRM. He holds a PhD degree in Civil Engineering (rock mechanics) from the University of Toronto, Canada.

Omid Mahabadi is president and CEO of Geomechanica. Omid's areas of expertise range from numerical and experimental rock mechanics to the development and use of hybrid continuum-discontinuum numerical methods to investigate failure processes in rocks.

Andrea Lisjak is the numerical modelling lead and a co-founder of Geomechanica. His area of expertise lies in the development and use of finite-discrete element numerical methods to investigate failure processes in rocks. He is the recipient of the 2015 Rocha Medal of the ISRM. He holds a PhD degree in Civil Engineering (rock mechanics) from the University of Toronto, Canada.

GEOMECHANICA

For more information and to inquire about our special offers for course participants contact us at:

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Event information:

Venue	15th International ISRM Congress
Where	Salzburg Congress
	Salzburg, Austria
When	Tuesday, October 10, 2023
Website	www.isrm2023.com