ARMA Future Leader Webinar Series

Every Two Weeks on Fridays 9-10 AM MT (11 AM -12 PM ET)

Impacts of hydrothermal veins on geomechanics from mineral grain to excavation scales

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https://westernuniversity.zoom.us/j/99355457319

Abstract

Hydrothermal veins are a geological complexity often associated with base metal ore deposits, such as porphyries and skarns, and have been found to influence geomechanical rock properties of laboratory specimens as well as rockmass stability around deep excavations. Vein characteristics that control behaviour include mineralogy, mineral grain configuration, vein and vein network geometries, and relationship to host rock lithology. My research team has developed methods to include hydrothermal veins in field rockmass characterization through the Composite Geological Strength Index, drill core logging and laboratory sample selection protocols, and brittle overbreak prediction. At the laboratory testing scale, our work highlights the importance of including veined specimens in test programs to capture representative rock properties (stiffness, brittle damage thresholds, and strength), illustrates differing strength influence of strengthening or weakening veins, and explores the influences of vein orientation and thickness on emergent specimen strength. Vein microstructure is also an important control on emergent specimen strength where, for example, unconfined compressive strength

specimens with antitaxial veins induce weaker specimen strength compared to those with syntaxial veins. This work involves development of calibrated numerical simulations to supplement the physical laboratory research activities. This presentation will provide multi-scale insight to hydrothermal vein geomechanics and recommendations for including hydrothermal veins in modern rock engineering design.

Biography

Dr. Jennifer (Jenn) Day is a Geological Engineer and is registered as a Professional Engineer (PEng) in Ontario and New Brunswick and a Professional Geoscientist (PGeo) in Ontario and New Brunswick, Canada. She is an expert in engineering geology, site investigation, physical rock mechanics (geomechanics), rock engineering, geohazards, and advanced computational analysis for rock engineering in complex heterogeneous rockmasses encountered in mining, geohazard assessment, tunneling, long-term underground nuclear waste storage, and shoreline cliff and sea stack stability. Before joining the Department of Geological Sciences and Geological Engineering at Queen's, Jenn spent three years as an Assistant Professor in the Department of Earth Sciences (cross-appointed to Civil Engineering) at the University of New Brunswick. She is honoured to be the first Canadian to receive the Richard Wolters Prize from the International Association for Engineering Geology and the Environment (2022) for meritorious scientific achievement by a young engineering geologist (under 35) and first Canadian to receive the Dr. N.G.W. Cook PhD Dissertation Award from the American Rock Mechanics Association (2017). She is currently serving as Past President of the Canadian Rock Mechanics Association and Divisions and Committees Representative of the Canadian Geotechnical Society.