International Society for Rock Mechanics and Rock Engineering

ISRM

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28th April 2022

07:00 GMT

(17:00 AEST)

(19:00 NZST)

Experimental analyses of burst type extreme rock failures and rock fracture under high-stress conditions

Dr. Selahattin Akdag

(University of Adelaide)

Coseismic rock slope failure mechanisms – insights from landslides triggered by the 2016 Mw 7.8 Kaikōura earthquake

Corinne Singeisen

(University of Canterbury)

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Next session:

May 2022

Directional and 3-D Confinement-Dependent Fracturing, Strength and Dilation Mobilization in Brittle Rocks
Dr. Masoud Rahjoo (Canada)

Stochastic Discrete Element Modelling for Pillar Strength Determination: A First Step in a Risk Based Pillar Design Approach
Juan J. Monsalve (US)

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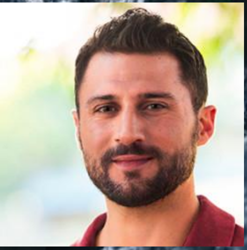
Experimental analyses of burst type extreme rock failures and rock fracture under high-stress conditions

Abstract

Deep underground rock engineering operations are challenging tasks and costly projects, which require special attention and design considerations. Rock burst-like extreme rock failures, the sudden and violent energy release of a large volume of overstressed rock, can kill people and cause serious damages to deep underground engineering infrastructures. The fundamental underlying mechanism of rock bursting is still not adequately understood. Can we predict and mitigate the risks of these catastrophic rock failures in deep tunnels and mines? Is it possible to determine what material properties control strain energy characteristics and how to bridge them with bursting in the laboratory? Can we estimate the energy demand for dynamic support systems using the excess stored strain energy concept? We have developed an experimental-theoretical framework delineating the 'snap-back' behaviour of rocks and underpinning the principles of energy storage and dissipation during failure. The study presents this systematic approach for reducing the consequences of rock bursts which will contribute to making deep tunnels and mines safer and more sustainable in the future.

Speaker

Dr. Selahattin Akdag is a postdoctoral research associate at the University of Adelaide. He obtained his PhD in 2019 from the University of Adelaide, investigating the mechanism of strain burst in deep mines under coupled influence of elevated temperature and high confinement. After completing his PhD, he continued his work on strain burst, focusing on in-situ stress measurement methods and stress memory effects in rocks. His current project is related to an innovative coal burst system to investigate the influence of confinement loss and pre-conditioning on coal burst mechanism.



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Coseismic rock slope failure mechanisms – insights from landslides triggered by the 2016 Mw 7.8 Kaikōura earthquake

Abstract

The 2016 Mw 7.8 Kaikōura earthquake in New Zealand's South island triggered many thousand landslides, which caused widespread damage to infrastructure highlighting the importance of understanding processes leading to coseismic slope failures. Using an integrated approach of field mapping, remote sensing analysis, geophysical surveys and numerical modelling, we developed conceptual models of earthquake-induced landslides triggered by the 2016 Kaikōura event. Based on these detailed site-specific analyses, we illustrate the fundamental control of lithologies and rock mass damage over failure mechanisms and initiation processes. Highly jointed Cretaceous greywacke rock slopes failures appear to develop through complex failure stages with the rupture plane initiating close to the ridgetop and propagating downslope along pre-existing, low-persistent joints. These failures are therefore likely controlled by orientation of m-scale discontinuities, slope angle, rock mass strength, and, potentially, amplification effects due to seismic shaking. On the other hand, landslides in Neogene siltstone displace as coherent rockslides and likely initiate along weak high persistence bedding planes suggesting that bedding-slope alignment plays an important role in landslide susceptibility. This demonstrates that landslide susceptibility and, subsequently, landscape evolution is significantly influenced by failure mechanisms.

Speaker

Corinne Singeisen is a PhD candidate at the University of Canterbury in Christchurch, New Zealand researching earthquake-induced slope instabilities. Before starting her PhD in early 2020, Corinne obtained an MSc in Engineering Geology from ETH Zurich in 2017 and worked as an engineering geologist in Valais, Switzerland. Her research interests include geomorphology, landscape evolution, rock mechanics and hazard and risk assessment of unstable rock slopes.