

AfriRock 2017

ISRM International Symposium 'Rock Mechanics for Africa'

30 September–6 October 2017
Cape Town Convention Centre, Cape Town



Keynote Speakers

Nick Barton
Sergio Fontoura
Luis Lamas
Dick Stacey
Nielen van der Merwe
Paul Buddery

BACKGROUND

The 2017 ISRM International Rock Mechanics Symposium is to be held in Cape Town. The conference theme is 'Rock Mechanics for Africa'. Mining has traditionally been a mainstay of African economies, while Oil and Gas industries are rapidly growing throughout Africa. Infrastructure is being developed to support these industries. Rock engineering design is and therefore will continue to be essential for the growth of the continent. Prior to the conference, the ISRM Board, Council and Commission meetings will take place. Technical visits are being arranged for after the conference.

WHO SHOULD ATTEND

- Rock engineering practitioners
- Researchers
- Academics
- Mining engineers
- Civil engineers
- Petroleum engineers
- Engineering geologists.

TECHNICAL VISITS

The following technical visits are confirmed for the conference:

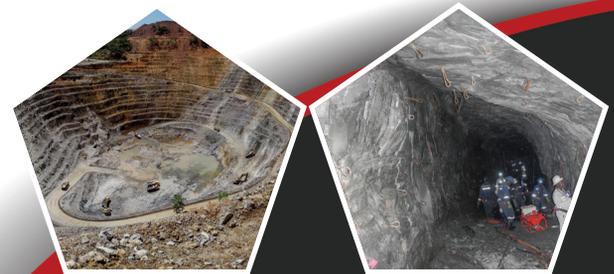
- Palabora Mine
- Tau Tona Mine
- Chapman's Peak
- SANIRE Presidential Tour

Sponsors



PROGRAMME

Saturday 30/09/2017	Sunday 1/10/2017	Monday 2/10/2017	Tuesday 3/10/2017	Wednesday 4/10/2017	Thursday 5/10/2017	Friday 6/10/2017
ISRM Board Meeting	ISRM Board Meeting	ISRM Commission Meetings	Technical Session Morning Refreshments Technical Session Lunch		Workshop	Technical Visits
Workshop		ISRM Council Meetings	Technical Session Afternoon Refreshments Technical Session		Workshop	
	Board Dinner	Network Function		Conference Dinner		<ul style="list-style-type: none"> ➤ Palabora Mine ➤ Tau Tona Mine ➤ Chapman's Peak



For further information contact:

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SAIMM, P O Box 61127, Marshalltown 2107
Tel: +27 (0) 11 834-1273/7 · E-mail: camielah@saimm.co.za
Website: <http://www.saimm.co.za>

EXHIBITION/SPONSORSHIP

Sponsorship opportunities are available. Companies wishing to sponsor or exhibit should contact the Head of Conferencing.



Announcement

Abstracts received for AfriRock Symposium 2017 · 30 September–6 October 2017

KEYNOTES

Rock engineering as a creator of value

T.R. Stacey, *University of the Witwatersrand, South Africa*

Mythperceptions in rock engineering

N. van der Merwe, *Stable Strata, South Africa*

Lessons from large failures: geology, stress and support

N. Barton, *Nick Barton & Associates, Norway*

Stress measurements for underground powerhouses – three recent cases

L. Lamas, *ISRM*

The Grosvenor strata control journey: learning and adapting from new and challenging experiences

P.S. Buddery, *Anglo American Met Coal, Australia*

How rock mechanics can help oil well drilling — Latest developments

S. Fontoura, *Pontifical Catholic University of Rio de Janeiro, Brazil*

ABSTRACTS

Stability analysis on the layered surrounding rock mass of large underground powerhouse of Wudongde Hydropower Station

China Three Gorges Corporation, China

Rock anchoring beam excavation and shaping technology for the underground powerhouse of Hydropower Stations

China Three Gorges Corporation, China

Deformation and stability analysis for the large-scale tailwater surge chamber of the Baihetan Hydropower Station

China Three Gorges Corporation, China, Hydro China Itasca Research and Development Center, Powerchina Huadong Engineering Corporation Limited, China

Deformation and failure analysis of large underground hard-rock chambers under high geo-stress: A case study of the underground powerhouse on the right bank of Baihetan Hydropower Station

China Three Gorges Corporation, China

Research of deformation and failure characteristics, mechanism, and engineering countermeasures for surrounding rocks in underground chambers of Baihetan Hydropower Station

China Three Gorges Corporation, HydroChina Itasca Research and Development Center, Powerchina Huadong Engineering Corporation Limited, China

The dam foundation grouting engineering management based on 3D geological model and monitoring system

China Three Gorges Corporation, China

Research of countermeasures for excavation of medium- and high-stress basalts at Baihetan Hydropower Station

China Three Gorges Corporation, China

Research of excavation and shaping of medium-high-stress basalt underground chambers at Baihetan Hydropower Station

China Three Gorges Corporation, China

Research of excavation and support measures for columnar jointing sections in the diversion tunnel of Baihetan Hydropower Station

China Three Gorges Corporation, China

Discussion on the excavation and support technology of underground chambers in the steep, small-inclined-angle rock stratum at Wudongde Hydropower Station

China Three Gorges Corporation, China

Research of countermeasures for phyllite excavation in the water diversion tunnel of Nepal Upper Madi Hydropower Station

China Three Gorges Corporation, China

Research of key technology for excavation and shaping of large-scale granite chambers in the Three Gorges Underground Powerhouse

China Three Gorges Corporation, China

A case study on a risk based approach to stope design

SRK, South Africa

Conceptual design for an arched sub-level pillar at Lace Diamond Mine in Kroonstad South Africa

Brentley, Lucas and Associates, South Africa

Comparison between thin spray on liners and shotcrete as surface support mechanisms in tunnels

University of Cape Town, South Africa

Time dependent failure of open stopes at Target Mine

Brentley, Lucas and Associates, South Africa

Reassessing continuous stope closure data using a limit equilibrium displacement discontinuity model

University of Pretoria, South Africa

Geomechanical evaluation enabled successful stimulation of apollonia tight chalk reservoir in Abu-Gharadig Basin, Egypt

Khalda Petroleum Company, Egypt

A review on rockburst risk assessment in tunnelling and mining

Institute of Rock Mechanics and Tunnelling, Graz University of Technology, Austria

Techniques for three-dimensional displacement vector using ground-based interferometric synthetic aperture radar

Hexagon Mining, South Africa, IDS GeoRadar, Italy

Rock mechanics challenges during construction of the Cheves Hydro Power Project - a case study

South Africa

An investigation in to the uncharacteristic in-stope support behaviour on the UG2 Reef horizon at Lonmin's K3 shaft

Lonmin, South Africa

Slope design aspects considerations for shallow open pit mines: A case study at Mamatwan Mine, Northern Cape Province

University of Johannesburg, South Africa

A novel approach to establish the Merensky reef crush pillar stability and the impact of sidings and pillar holing width

Bafokeng Rasimone Platinum Mine, South Africa

Back analysis of Merensky reef cube strength

Bafokeng Rasimone Platinum Mine, South Africa

Reef drive protection pillar stability assessment through numerical modelling

Advisian, South Africa

Assessment of the risks in undermining of a surface stream in a shallow coal mine

Glencore, South Africa

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Coal pillar stooping – Partial extraction of coal pillars ensuring panel stability

Glencore, South Africa

Coal pillar stooping – Assessing the stability of snooks

Glencore, South Africa

The effect on undercutting an unstable layer on roof stability

Bafokeng Rasimone Platinum Mine, South Africa

Stability of middling between two tabular chrome seams

Hernic, South Africa

Assessing roof stability in a coal mine

South Africa

Extraction of hard rock strike pillars

Bafokeng Rasimone Platinum Mine, South Africa

Investigation of a failure associated with a major shear zone in the Main Pit Cut 3 West, at Letšeng Diamond mine

Lesotho Letšeng Diamonds, University of Kwazulu Natal, South Africa

Advanced information on rock mass properties in large open pits by analysing production drill rig parameters in real time

Groundwork Consulting, South Africa

Case studies demonstrating advances in geotechnical instrumentation and monitoring and the decision making implications for mine rock engineers

Groundwork Consulting, South Africa

Rock engineering considerations for the extension of a vertical rectangular shaft in a jointed rockmass adjacent to a large open-pit

GeoSindile (Pty) Ltd, South Africa

Assessment of vertical shaft stability in the zone of influence of a large open-pit

GeoSindile (Pty) Ltd, South Africa

The mineralogical and geotechnical properties of the sandstone ‘parting’ between the Alfred seam and the Gus seam in the Magdalena Colliery, Dundee

South Africa University of KwaZulu-Natal, Buffalo Coal, South Africa

Application of controlled blasting to minimize limit wall damage at Letšeng Diamonds Lesotho

University of KwaZulu-Natal, South Africa

Full scale dynamic tests of a ground support system using high-tensile strength chain link mesh in El Teniente Mine, Chile

Chile University / Codelco El Teniente, University of Applied sciences Zurich, Geobrugg AG, Santa María University, Geobrugg Andina Groep T University / Geobrugg Southern Africa (Pty) Ltd, Chile, South Africa

Improving the mining efficiencies as a result of a new support design at Unisel Gold Mine, Welkom, South Africa

Brentley, Lucas & Associates (Pty) Ltd, South Africa

Rockburst prevention due to destress blasting in roof competent rocks in hardcoal longwall mining

Institute of Geonics of the Czech Academy of Sciences, Czech Republic

Optimizing stoping panel spans at an Eastern bushveld platinum mine

Impala Platinum, South Africa

Pillar scaling and pillar fracturing in deep level gold mines in South Africa 1Deep level gold mine

The University of the Witwatersrand, South Africa

Remediation of abandoned mines for residential development

Oweis Engineering Inc, The Falcon Group, USA

A model-oriented, remote sensing approach for the derivation of numerical modelling input data: Insights from the Hope Slide, Canada

Simon Fraser University, Canada

A Study of multi-reef pillar extraction in the Carletonville area

SibanyeGold, The University of the Witwatersrand, South Africa

Parameters required for the design of rock support in highly stressed rock masses

Norwegian University of Science and Technology, Norway

A tool for the evaluation of departmental effectiveness

Advisian, South Africa

Simultaneous extraction of three coal seams with stowing – A case study

CSIR-Central Institute of Mining & Fuel Research, India

Preliminary investigation to areal shape effect of pillar strength

University of Pretoria, South Africa

Towards a formal Rock Engineering Qualification in the South African Mining setup

University of Pretoria, South Africa

Development of a site specific floor deformation index to assess floor heave risks

Anglo American Met Coal, Anglo American Grosvenor Mine, Australia

Characterization and numerical modelling of standard and cabled strapped pillars in a hematite mine

University of Vigo, Spain

Application of rock mass classification and blastability index for the improvement of wall control in hard rock open pit mining: a case study

The University of the Witwatersrand, South Africa

Comparison of observational, empirical and 3D discrete numerical methods to estimate subsidence over longwall coal faces

University of Vigo, Itasca Consultores SL, Spain

A multi-objective hybrid prediction model of slope deformation based on fuzzy optimization algorithm

Yangtze River Scientific Research Institute, China

Numerical simulation of fully grouted rock bolts by considering the non-linear bond-slip behaviour

Nanyang Technological University, Singapore

Otjikoto gold mine – a case study on the pit slope design

SRK, South Africa

Modelling of structural controlled slope failure using photogrammetry techniques

SRK, South Africa

The effect of seismic sensor frequency on the results of routine seismic monitoring analyses techniques

Australian Centre for Geomechanics, Australia

Microseismicity characteristic and rockburst risk mitigation during the breakthrough in deep-buried tunnels of the Jinping-II Hydropower Station, China

Chinese Academy of Sciences, China

A holistic open-pit mine slope stability index using Artificial Neural Networks

University of Johannesburg, South Africa

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An investigation on the relationships between the petrographic, physical and mechanical characteristics of sandstones from Newspaper Member of the Natal Group
University of KwaZulu University of Johannesburg, South Africa

The significance of identifying potential failure mechanisms from conceptual to design level for open pit rock slopes
University of KwaZulu, University of Johannesburg, South Africa

Stability of large cavern in anisotropic rock
Kajima Corporation, Japan

Case study to achieve gas-tightness and stability of large cavern in Kurashiki LPG stockpiling base, Japan
Kajima Corporation, JOGMEC Japan Oil Gas and Metals National Corporation, Japan

Support method of hard rock in underground engineering with high geo-stress: A case study of the Baihetan underground cavern, China
Chinese Academy of Sciences, China

A critical review of the findings from *in situ* stress measurements conducted in Southern Africa during the past ten years
Hands on Mining cc, Groundwork Consulting, South Africa

Study of innovative technologies for underground excavations monitoring during construction and operation phases
University of Parma, Italy

Fundamentals of underground pillar design
Middindi Consulting (Pty) Ltd, University of Pretoria, South Africa

An empirical and numerical approach to quantifying raise-bore hole stability
Middindi Consulting (Pty) Ltd, South Africa

Slope stability of soft material benches in open pit mining
Middindi Consulting (Pty) Ltd, South Africa

Microseismic events for slope stability analysis – A case study at an open pit mine
CSIRO Energy, Australia

Modeling hydraulic fracturing in hard rock using a continuous-discontinuous method
Chinese Academy of Sciences, China

Mining with crush pillars
Lonmin Platinum, University of Pretoria, South Africa

Unravelling the structural mysteries of the Bermuda Triangle at Lonmin's Saffy Shaft Lonmin Plc
Terra Explora Consulting, South Africa

A practical approach to quantifying the effects of pillar mining in a rigid hard rock environment
Lonmin Plc, South Africa

Understanding the influence of geological structures – an often overlooked important aspect in the stability of operating mines
Independent Consultant, Lonmin Platinum, Canada, South Africa

The effectiveness of a coupled large annulus resin bolting system installed in a conventional narrow tabular orebody utilizing conventional equipment
Lonmin Plc, South Africa

Crack propagation energy determination for rock materials under static and impact loading
Karadeniz Technical University, Turkey

Cautious balst design and practice in close proximity to a railway tunnel and apartment buildings
Middle East Technical University, Turkey

Fault rock mass characterization using descriptive statistics during preliminary geotechnical investigation Pahl Fault Zone (Windhoek), Namibia
China Geosciences University, Letseng Diamonds, Geological Survey of Namibia, China, Namibia

Evaluation of crack displacement in underground excavations using wireless technology crack meters
University of the Witwatersrand, South Africa

Stable beam span re-design and support optimization for a shallow hard rock bord and pillar mine: The case of Unki mine, Zimbabwe
Unki mines (Pvt) Ltd, Zimbabwe

Excavation-induced seismicity: mechanism and implications
Nanyang Technological University, Tsinghua University, China

The impacts of plastic deformation on productivity in low-permeability reservoirs during hydraulic fracturing
Petro-Geotech Inc., Canada

Two phase flow coupled to geomechanics by dual porosity model: simulating fractured reservoirs by finite element method
Petro-Geotech Inc., Canada

Induced stresses and SRV calculation near a hydraulic fracture in the naturally fractured reservoir
Petro-Geotech Inc., Canada

Relating source mechanisms to damage phenomena in platinum mines of the western Bushveld complex
Yuba, South Africa

Numerical simulation of a segmental lining and rock mass interaction
Graz University of Technology, Austria

Numerical detection of voids within a pea gravel backfilled annular gap of a TBM using GPR
Graz University of Technology, Austria

A numerical study of the influence of pre-existing discontinuities on the hydraulic fracturing process
Amirkabir University of Technology, Iran

Continuum modelling of the behaviour of high rock slopes
Amirkabir University of Technology, Iran

Performance evaluation of the Paboase crown pillar at Chirano gold mines in Ghana Kinross
Chirano Gold Mines Ltd, Ghana

Debris flow impact on flexible protection barriers small scale tests
University of Calabria, Italy

Supercritical CO₂ fracturing on shale under true triaxial stress conditions
Northeastern University, Chinese Academy of Sciences, China

Structurally controlled slope instability in residual soils at a southern African mine
SRK, South Africa

An overview of safety critical monitoring at Kao Mine, Lesotho
SRK, South Africa

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'Early access' microseismic monitoring using sensors installed in long boreholes

Sudbury Integrated Nickel Operations, A Glencore Company, Engineering Seismology Group (ESG), Canada Inc., Canada

Optimizing presplit performance in highly jointed rock formations

Curtin University-Western Australian School of Mines, Australia

Revised pillar design for a Zimbabwe bord and pillar operation using a combination of empirical, linear elastic and non-linear analysis

SRK Consulting (Pty) Ltd, South Africa

Sand management and CHOPS with thermally effects

Petro-Geotech Inc., South Africa

Hydraulic fracturing initiation and the induced stresses near a horizontal well in a thermo-poroelastic medium: Model and applications to enhanced geothermal system

Petro-Geotech Inc., South Africa

Modelling salt rock dissolution in the foundation of a large dam

Tractebel France, Gennevilliers, Independent Consultant, France, Belgium

Stability of large underground rock caverns for crude oil storage operated below atmospheric pressure

Geostock Entrepouse, France

Discrete element modeling of rock cutting experiments under confining pressure

University of Mons, Belgium

Controlled damage - unfolding the design, risk and cost

AEL, South Africa

Support design for tunnels with large overburden in weak rock

Graz University of Technology, Austria

Numerical modeling of the shallow crystal stress field in Chinese mainland with the constraint of *in situ* measured stress

China Earthquake Administration, China

The application of risk assessments in rock engineering design of open pit mines

SRK Consulting (Pty) Ltd, South Africa

Use of plastic composites as friction rock bolt materials

Karadeniz Technical University, Turkey

Mechanism of the Taihongcun landslide triggered by the 2008 Wenchuan earthquake in Beichuan County

Chinese Academy of Sciences, China

The evaluation of rock bolt as rock support in underground gold mine Pongkor, west Java, Indonesia

Trisakti University, Indonesia

Assessment of closure by timber pack assessment method and its comparison to MAP3D convergence

University of the Witwatersrand, South Africa

Review of remnant mining practices in South African Gold Mines

University of the Witwatersrand, South Africa

Use of numerical modelling techniques to predict the extent and depth of failure of rock around a tunnel at intermediate depth as a way of validating the observations made by physical models

University of the Witwatersrand, SRK Consulting (Pty) Ltd, South Africa

Geotechnical data for Ivanplats

Platreef project Ivanplats (Pty) Ltd, SRK Consulting (Pty) Ltd, South Africa

Geological- and hydrogeological settings for rock engineering an example for grouting design at Äspö Hard Rock Laboratory, Sweden

Chalmers University of Technology, Norconsult AB, Sweden

Acoustic approach to estimation of rock mass state and prediction of induced seismicity parameters: theory, laboratory experiment and case study

Russian Academy of Science, Russia

Issues related to the long-term stability of unlined water tunnels – a case review

Norwegian University of Science and Technology (NTNU), Norway

The sub surface profiler: A giant leap for ground penetrating radar -

REUTECH Mining, South Africa

Borehole stability and sand production in gas reservoirs

Aristotle University of Thessalonik, SINTEF, Petroleum Research, Greece, Norway

Application of digital photogrammetry in QA/QC of drill core measured structural data

SRK Consulting (South Africa) (Pty) Ltd, South Africa

Design of weathered slopes to improve stability and economics

Kansanshi Mine, Zambia

Rock failure modes under uniaxial compression and indirect tension

Indian Institute of Technology Kharagpur, India

Experimental studies of variably saturated flow from a horizontal discontinuity to the vertical with and without an intersection

University of Pretoria, 2GaGE Consulting, South Africa

Characterizing microtremor signals of a slope with deep-seated gravitational deformation

National Taipei University of Technology, Taiwan

Influence of scale on fluid flow through fractured rock masses

BGTech Soil and Rock Engineering, Votorantim Metais, Brazil

Benchmarking of debris flow experimental tests using combined finite-discrete element method, FEMDEM

University of Turin, Imperial College of London, Italy, London

Reducing the risk to a mining project through timely and appropriate geotechnical data collection

First Quantum Minerals Limited, Zambia

Influence of heterogeneity at grain-scale on rockburst proneness Investigations on artificial samples

University of Technology, Austria

Influence of rocks's structure at grain-scale on rockburst proneness first investigations

University of Technology, Austria

Development of a rocks mass quality model for an open pit mine

Norwegian University of Science and Technology (NTNU), Norway

Contributions to geomechanical slope optimization at Goldcorp

Eleonore Mine Goldcorp, Laval University, Canada

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Numerical simulation of hydraulic fracturing process on composite rock mass

Tongji University, China University of Mining & Technology, China

Failure and debris mechanism of karst caves during drill and blast tunnelling

Tongji University, China University of Mining & Technology, China

Microseismic monitoring and stability analysis of deep underground powerhouse at the Lianghekou hydropower station, Southwest China

Powerchina Chengdu Engineering Corporation Limited, Sichuan University, China

Combining different vehicle LiDAR dates to discuss the characteristic of potential geological disaster along changchun Shrine Trail

National Taipei University of Technology, China

Numerical modelling of longwall goaf dynamics and properties for gas drainage design

CSIRO, Australia

Stability analysis and failure evolution of large-scale underground caverns in bedded rock masses from microseismic monitoring

Sichuan University, Powerchina, Chengdu Engineering Corporation Limited, China

PPV' to PPV: towards estimating the site effect due to surface waves generated along excavation surfaces

University of Leeds, SRK Pty (Ltd), Australian Centre for Geomechanics, United Kingdom, South Africa, Australia

Rock engineering for Boschkop intake works

Geoid Geotechnical Engineers, South Africa

Shaft sinking on the platreef project

Ivanplats, South Africa

The application of three-dimensional numerical modelling for defining the influence of slope curvature on stability for an open pit mine in Lesotho

SRK Consulting, South Africa

Numerical model calibration: Process or luck?

University of Pretoria, Middindi Consulting (Pty) Ltd, South Africa

Overburden response to longwall mining

CSIRO, Australia

Design of an *in situ* testing device for the backfill of mechanised driven tunnels in hard rock

Graz University of Technology,

Cost analyses of a mine roadway driven by conventional and mechanized methods

Bulent Ecevit University, Turkey

Analytical and experimental analysis of hard rock indentation process

Ecole Nationale d'Ingénieurs de Tunis, Université de Tunis El Manar, Tunisia

Progress of brittle micro-fracturing in crystalline rocks under cyclic loading conditions

Queen's University, Canada

Predictive strategies and risk management for rockbursting in deep tunnel and mine access development

Queen's University, Canada

Raisebore camera survey using drones

OceanaGold Corporation, Phillipines

Reinforced rock landfill design from coal boiler bottom ash, fly ash and geosynthetics- Şirnak case assessment on restoration

Şirnak University, Turkey

Observational studies in South African mines to mitigate seismic risks

CSIR, The University of the Witwatersrand, Council for Geoscience, Ritsumeikan University, SATREPS, Japan, South Africa, Switzerland, Australia, Italy, USA

InSAR monitoring for mines: an integrated approach, 'TRE ALTAMIRA

Optron Pty, Italy

Experimental study on the influence of tunnel excavation on neighboring underground structure

Konkuk University, Korea

An experimental study of wave propagation through fluid-filled rock joints

The Hong Kong Polytechnic University, Hong Kong

Technology transfer on minimizing seismic risk in the platinum mines

SiM Mining Consultants (Pty) Ltd, Middindi Consulting (Pty) Ltd, Simulated Training Solutions (Pty) Ltd, South Africa

The determination of crustal stress direction based on the borehole geometric shape using panoramic stereopair imaging technology

Chinese Academy of Sciences, China

Investigating crack initiation and propagation by rock-like materials

University of Queensland, Australia

Metolong dam slope stabilization and rock support

Gibb Consulting Engineers Pty Ltd, South Africa

'Design of stoping sequence at deeper horizons for a Lead-Zinc mine in sheared rock mass'

Central Institute of Mining and Fuel Research (CIMFR) Regional Center, Nagpur, India

Tracking cave shape development with microseismic data

Institute of Mine Seismology, Australia

Calibration of modelled seismicity in South African Mines

Institute of Mine Seismology, South Africa

Optimizing stope panel spans at an eastern bushveld Platinum mine by probabilistic analysis

Impala Platinum Limited, Marula Platinum Mine, South Africa

Calibration of a numerical model for bore-and-fill mining

CSIR, South Africa

Active ultrasonic imaging and interfacial characterization of stationary and evolving fractures in rock

University of Minnesota, USA

Experimental study on hydraulic conductivity of a rock joint

Seoul National University, Korea