

# Tuesday

## September 13



**Sanna Mustonen**  
Project Manager, Posiva Solutions Oy, Finland



**Diego Mas Ivars**  
Research Coordinator Geomechanics at SKB, Adjunct Professor at KTH Sweden

All times are EEST (Eastern European Summer Time)

Venue: Kaleva  
Chair:

9:00 **WELCOME**

9:15 **KEYNOTE SESSION**

**KEYNOTE 1 - SANNA MUSTONEN**

**KEYNOTE 2 - DIEGO MAS IVARS**

10:45 **BREAK, EXHIBITION, NETWORKING & POSTER SESSION** EXHIBITION AREA

Venue: Kaleva

Lumituuli

Palaver

Takka

11:15	SESSION 1	SESSION 2	SESSION 3	SESSION 4
	<b>RECENT ADVANCES IN ROCK MECHANICS RESEARCH 1</b>	<b>FIELD AND LABORATORY INVESTIGATIONS 1</b>	<b>MODELLING OF ROCK 1</b>	<b>MECHANICS OF ROCK JOINTS 1</b>

Chair:	11:15	11:30	11:45	12:00	12:15	12:30
	Micromechanical characterisation of overburden shales in the Horn River Basin through nanoindentation <b>Dr. Tom Charlton,</b> Newcastle University, United Kingdom	Degradation of fracture characteristics on Coconino sandstone due to water content <b>Prof. Tae Young Ko,</b> Kangwon National University, Republic of Korea	Numerical modelling of rock fragmentation for TBM based on peridynamics <b>Dr. Yuanbai Li,</b> Tongji University, China	Joint behavior during shear process using an innovative equivalent geomaterial and 3D printing technology <b>Abi Aad Emilio,</b> Université de Lorraine, France		
	Experimental investigation of the effect of thermal cycling on the thermomechanical properties of three rock varieties for high temperature thermal energy storage <b>Katharina Meta Neumann,</b> Ruhr-University Bochum, Germany	Measuring the hydraulic transmissivity of a rock joint under varying normal load <b>Lars Jacobsson,</b> RISE Research Institutes of Sweden, Sweden	Evaluation of displacement prediction method for mountain tunnels showing time-dependence characteristics <b>Makoto Uda,</b> Tekken Corporation, Japan	Effect of roughness and pore pressure on shear behavior of rock joint under true triaxial loading conditions <b>Dr. Daisuke Asahina,</b> Geological survey of Japan, AIST, Japan		
	The exploration of force chains in bonded granular materials: A numerical study <b>Min Zhang,</b> TU Freiberg Geotechnical institute, Germany	Evaluating face stability in mountain tunnel excavation by inclination monitoring at the tunnel crown - Atoda tunnel case study <b>Dr. Kazuo Sakai,</b> Taisei Corporation, Japan	Validation of a Continuum-based Weak Zone Joint Model for Simulating Anisotropic Rock Mass Strength <b>Ryn Ziebarth,</b> Dalhousie University, Canada	A multi-scale roughness shear joint model using wear theory <b>Min Gao,</b> University of New South Wales, Australia		
	Assessing the tunnel stability in brittle rocks based on strain bursting assessment <b>Dr. Chrysothemis Paraskevopoulou,</b> University of Leeds, United Kingdom	A novel method for automated trace discontinuity mapping at the Kemano hydroelectric tunnels in Western Canada <b>Josephine Morgenroth,</b> RockMass Technologies, Canada	Weakening of tensile strength of granitic rock by HV-HF-AC actuation of piezoelectric properties of Quartz: a 3D numerical study <b>Dr. Timo Saksala,</b> Tampere University, Finland	Evaluation of progressive damage of discontinuity asperities due to shearing by means photogrammetric survey <b>Dr. Maria Teresa Carriero,</b> Polytechnic of Turin, Italy		
	Why an indirect estimate of the unjacketed pore modulus may not work <b>Dr. Ali Tarokh,</b> University of Minnesota, USA	Use of a thermoplastic resin to generate rock surface impressions and geometrically accurate replicas <b>Dr. Mai Sawada,</b> Kyoto University, Japan	Improving Rock Pillar Stability Guidelines Through Detailed Numerical Investigation <b>Evan Dressel,</b> Queen's University, Canada	Geometrical aspects in the consideration of actual opposed surface along shearing direction in rock joints <b>Dr. Diego-José Guerrero-Miguel,</b> DinRock Group. University of Oviedo, Spain		
	A new approach to reduce blasting-induced vibration in tunnel blasting by utilizing the initiation time scatter of detonator <b>Youngmin Yoon,</b> Seoul National University, Republic of Korea	Assessment of static performance of welded mesh along mesh overlap used at Kiirunavaara mine <b>Dr. Ping Zhang,</b> Luleå University of Technology, Sweden	Visco-elastic constitutive law to simulate large creep deformations using particle based simulation approach <b>Miao Zhang,</b> TU Freiberg Geotechnical institute, Germany	Toppling of a rock block resting on a rough surface <b>Prof. Leandro R. Alejano,</b> University of Vigo, Spain		

12:45 **LUNCH, EXHIBITION, NETWORKING & POSTER SESSION** EXHIBITION AREA

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Venue:	Kaleva	Lumituuli	Palaver	Takka
13:45	<b>SESSION 5</b> <b>RECENT ADVANCES IN ROCK MECHANICS RESEARCH 2</b>	<b>SESSION 6</b> <b>ROCK MASS CHARACTERIZATION 1</b>	<b>SESSION 7</b> <b>MODELLING OF ROCK 2</b>	<b>SESSION 8</b> <b>FIELD AND LABORATORY INVESTIGATIONS 2 &amp; ROCK STRESS MEASUREMENT 1</b>
Chair:				
13:45	Early warning of overbreaks in tunnels <b>Manuel Entfellner</b> , Implenia Österreich GmbH, Austria	Application of the rockfall activity rate system (RoARs) <b>Prof. Michael Olsen</b> , Oregon State University, USA	Modelling of progressive failure mechanism of mine pillars <b>Dr. Giuseppe Cammarata</b> , Bentley Systems, Italy	Instrumental response of borehole tensor strainmeters for oblique-incident seismic waves <b>Prof. Jiayong Tian, N</b> ational institute of Natural Hazards, Ministry of Emergency Management, China
14:00	A New Explanation of Loading Rate Effect on Rock Compressive Strength <b>Dr. Jun Zhu</b> , Chinese Academy of Sciences (CAS), China	Method to obtain 3D point clouds of tunnels using smartphone LiDAR and comparison to photogrammetry <b>Masoud Torkan</b> , Aalto University, Finland	An advanced constitutive model for transversely isotropic rock - Evaluation of two different regularization approaches <b>Thomas Mader</b> , University of Innsbruck, Austria	Consideration of the mechanical behaviour and the influence on ground of vertical reinforcement <b>Tomohisa Amemiya</b> , Tokyo metropolitan university, Japan
14:15	Probabilistic characterization of correlation between two rock properties: a data-driven approach <b>Dr. Adeyemi Aladejare</b> , University of Oulu, Finland	A geotechnical evaluation of the Cumba Pit Slope Failure, Dominican Republic <b>Neil Bar</b> , Gecko Geotechnics, Australia	Piezoelectric excitation of quartz in granite for improved drillability <b>Arturo Rubio Ruiz</b> , Tampere University, Finland	Fibre Spray Concrete: Testing and Performance Criteria <b>Benoit De Rivaz</b> , Bekaert, France
14:30	Energy Release Resulting from Sudden Excavation Shape Changes during Two-sided Strainbursts <b>Dr. Fedilberto Gonzalez</b> , Queen's University, Canada	Rapid tunnel scanning using a 360-degree camera and SfM photogrammetry <b>Dr. Mateusz Janiszewski</b> , Aalto University, Finland	A new phase-field mixed-mode failure model for rock fracture and rock slope stability analysis <b>Dr. Yunteng Wang</b> , University of Natural Resources and Life Sciences, Austria	Experiences and preliminary results of geophysical methods on historical statues <b>Dr. Federico Vagnon</b> , Politecnico di Torino, Italy
14:45	Numerical and laboratory investigations of thermally induced fractures in rock salt <b>Feline Koerner</b> , Institute for Geotechnical Engineering, Germany	Estimating the Hydraulic Conductivity of jointed rock mass using Genetic Programming <b>Prof. Murat Karakus</b> , The University of Adelaide, Australia	A weakening-healing law to simulate stick-slip behavior of rock joint and the associated seismicity <b>Dr. Qingsheng Bai</b> , TU Bergakademie Freiberg, Germany	Effect of layer orientation on behaviour of 3D-printed rock specimens in indirect tensile testing <b>Weiyi Yang</b> , University of Adelaide, Australia
15:00	Determination of elastic constants of a transversely isotropic rock from a single-orientation core using strip load test and artificial neural network <b>Prof. Ki-Bok Min</b> , Seoul National University, Republic of Korea	Remote mapping and characterization of geological rock-mass features employing advanced data analytics and artificial intelligence. <b>Dr. Mathias Smesnik</b> , AFRY Austria GmbH, Austria	Automatic Extraction of Rockfall Source based on Terrain Analysis Map Using Support Vector Machine <b>Naoko Sakamoto</b> , Okayama University, Japan	A refined evaluation method for the stress field of the Chang 73 shale oil reservoir of northern Shaanxi <b>Yu Zhang</b> , China University of Petroleum, China

15:15 **COFFEE, EXHIBITION, NETWORKING & POSTER SESSION** EXHIBITION AREA

15:45	<b>SESSION 9</b> <b>FIELD AND LABORATORY INVESTIGATIONS 3</b>	<b>SESSION 10</b> <b>ROCK MASS CHARACTERIZATION 2</b>	<b>SESSION 11</b> <b>ROCK STRESS MEASUREMENTS 2</b>	<b>SESSION 12</b> <b>ROCK DRILLING</b>
Chair:				
15:45	Dynamic compressive behaviour of Rewa shale through SHPB tests <b>Venkatesh M Deshpande</b> , Indian Institute of Technology, India	Geotechnical assessment of rock masses in metallic mineral deposits, a view on the "hidden" issues in open-pit design <b>Igor Pesevski</b> , Faculty of civil engineering - Skopje, North Macedonia	Monitoring of rock stress change in deep mine using displacement measurements <b>Dr. Lauri Uotinen</b> , Aalto University, Finland	Drilling Boreholes in Sulphurous Groundwater Areas: Elements of Some Case Studies in Portugal <b>Prof. Luis Manuel Ferreira-Gomes</b> , Univesity of Beira Interior - Covilhã, Portugal
16:00	Evaluation of the Performance of the ISRM Suggested Methods for Measuring Density and Porosity when Applied to Low-Porosity Rocks <b>Risto Kiuru</b> , Aalto University, Finland	Blominmäki - Underground Wastewater Treatment Plant <b>Jari Haapala</b> , AFRY Finland Oy, Finland	Use of flow-back and pressure rebound data improves the minimum stress estimation in a tight claystone formation <b>Christophe de Lesquen</b> , Andra, France	Application of Seismic Sensors on Measurement While Drilling for Real-time Rock Property Detection <b>Dr. Manoj Khanal</b> , Commonwealth Scientific and Industrial Research Organization, Australia
16:15	Influence of Temperature and Deviatoric Stress on Creep Behavior of Rock Salt <b>Prof. Khalid Alshibli</b> , University of Tennessee, USA	Klaukkala Mt132 bypass: The use of photogrammetric models in engineering geological analyses for excavation and reinforcement design in a BIM environment. <b>Lassi Hatakka</b> , Kalliosuunnittelu Oy Rockplan Ltd, Finland	A Bayesian regression analysis of in situ stress using overcoring data <b>Prof. John P. Harrison</b> , University of Toronto, Canada	Experimental study of frictional resistance influences on tunnel face stability <b>Ryo Kawanoue</b> , Saitama University, Japan
16:30	Study of size effects on the peak and residual strength of intact and artificially fissured granite samples <b>Manuel Alejandro González Fernández</b> , University of Vigo, Spain	The challenge of characterization of rock mass in karstic zones case study of a tunnel failure in Jerusalem, ISRAEL <b>Moshe Levin</b> , Geotope-Levin Geological consultants, Israel	Using cavity contraction creep displacements to identify principal stress boundaries in competent rock <b>Yasmin Byrne</b> , Cambridge Insitu Ltd, United Kingdom	Prediction of Pilot Hole Drilling Performance of Raise Boring Machines based on Raise Inclination and Rock Properties <b>Prof. Hanifi Copur</b> , Istanbul Technical University, Turkey
16:45	Laboratory-scale Rockburst Physical Model Testing Using a True-Triaxial Cell <b>Doandy Yonathan Wibisono</b> , Colorado School of Mines, USA	Potential applications of deep learning in automatic rock joint trace mapping in a rock mass <b>Jessica Kayi Chiu</b> , Norwegian Geotechnical Institute, Norway	An investigation on relations between energy dissipation and dynamic compressive strength of Kemi-Peridotite at high strain rates <b>Toochukwu Ozoji</b> , University of Oulu, Finland	Remotely Operated Submersible Drilling Rig for Offshore Rock Investigations <b>Martin Heredia Bilbao</b> , Geociencias y Exploraciones Marítimas (GEM), Spain
17:00	Hybrid InSARTrac for Monitoring Interglacial Movement Patterns <b>Christoph Zambanini</b> , Graz University of Technology, Austria	Effects of uncertainties on block volume estimation <b>Prof. Gessica Umili</b> , University of Turin, Italy	Discrete Element Method Simulation of Borehole Breakout Based on the Strain Energy Concept <b>Zizhuo Xiang</b> , University of New South Wales, Australia	Predicting the geological condition beyond the tunnel excavation face using MSP monitoring data and LSTM algorithm <b>Je-Kyum Lee</b> , Hanyang University, Republic of Korea

19:00 **DINNER**

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# Wednesday

## September 14

Venue: Kaleva

9:00 **KEYNOTE SESSION**

**KEYNOTE 3 - MICHAEL DI GIOVINAZZO**

**KEYNOTE 4 - JOHN HARRISON**  
**IS EUROCODE 7 THE FUTURE OF ROCK ENGINEERING?**



**Michael Di Giovinazzo**  
Principal Consultant - Mining Geomechanics Engineer at SRK Consulting. Member Australasian Institute of Mining and Metallurgy, AusIMM, Finland



**John Harrison**  
W.M. Keck Chair of Engineering Rock Mechanics Lassonde Institute of Mining Dept. of Civil & Mineral Engineering University of Toronto, Canada

10:30 **BREAK, EXHIBITION, NETWORKING, POSTER SESSION** EXHIBITION AREA

Venue: Kaleva

Lumituuli

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11:00 **SESSION 13**

**SESSION 14**

**SESSION 15**

**SESSION 16**

**FIELD AND LABORATORY INVESTIGATIONS 4**

**ROCK MASS CHARACTERIZATION 3**

**CASE STUDIES**

**ROCK ENGINEERING**

Chair:

11:00	An approach to estimate influence region of field investigation sampling points, investigation zone in civil infrastructure projects and brief review of existing field investigation process. <b>Naval Singh</b> , Atkins Sverige AB, Sweden	Definition of Structural Domains Using Acoustic Borehole Image Televiwer Data in Minera Los Frailes Mining Site, Sevilla, Spain <b>Martin Heredia Bilbao</b> , Geociencias y Exploraciones Maritimas (GEM), Spain	Rock engineering challenges in Lyyra (city block of science and economy), Helsinki, Finland <b>Ulla Sipola, Sitowise Oy, Jesse Ström</b> , Rock Mechanics Consulting Finland Oy (RMCF), <b>Terhi Seppälä</b> , Sitowise Oy, Finland	Impact identification on flexible rockfall barriers: on site test of a wireless monitoring system <b>Prof. Andrea Segalini</b> , Università di Parma, Italy
11:15	The pressure dependent elastic anisotropy of Grimsel granite and Bukov paragneiss <b>Dr. Ali Aminzadeh</b> , Institute of Geology of the Czech Academy of Sciences, Czech Republic	Assessment of the creep behavior of siltstone for the Snowy 2.0 hydropower station using multistage uniaxial creep tests <b>Samer Abou Kheir &amp; Andrea Brogiato</b> , Tractebel, France	Application of DInSAR for monitoring slopes around a dam basin in Japan <b>Yukiko Shoji</b> , Electric Power Development Co., Ltd., Japan	The Effect of Notches on Breakdown Pressure during Hydraulic Fracturing at various stress regimes <b>Ben Powlay</b> , The University of Adelaide, Australia
11:30	Laboratory block model tests simulating rock anchoring in rock mass <b>Bjarte Grindheim</b> , Norwegian University of Science and Technology (NTNU), Norway	Interpreting ultrasonic pulse velocities and elastic properties of lac du bonnet granite under compression <b>Mark McDonald</b> , Queen's University, Canada	Managing geotechnical risk in high-uncertainty environments <b>Iñaki García Castro</b> , SRK Consulting, United Kingdom	Coupled Thermo-Mechanical Study of Crack Initiation Stress Threshold in Porous Sandstone <b>Dr. Mehdi Serati</b> , University of Queensland, Australia
11:45	Experimental Device for the Determination of Fracture Toughness at High Pressure <b>Prof. Jordi Delgado Martin</b> , University of A Coruña, Spain	3D slope stability analysis of a limestone quarry expansion in Northern Italy <b>Dr. Daniele Martinelli</b> , Politecnico di Torino, Italy	Mechanical and physical characterization mapping of evaporitic rocks from Abu Dhabi city and its surroundings <b>Prof. Hasan Arman</b> , United Arab Emirates University, United Arab Emirates	Excavation of road tunnels with zero... negative rock cover <b>Jukka Salminen</b> , AFRY Finland Oy
12:00	Tensile strength of anisotropic rocks from enhanced Brazilian laboratory testing and data analysis protocols <b>Timothy Packulak</b> , Queen's University, Canada	The Karavanke Tunnel – 30 years later <b>Julija Fux</b> , IRGO Consulting d.o.o., Slovenia	High-speed train induced vibration measurements in fresh tunnel shotcrete layer <b>Dr. Topias Siren</b> , Sweco, Finland	A preliminary study of hydro-mechanical properties for bentonite-sand mixture <b>Prof. Tomoyoshi Nishimura</b> , Ashikaga University, Japan
12:15	Is soft rock also non-abrasive rock? An evaluation from lab testing campaigns <b>Dr. Markus Kaspar</b> , TU Graz, Austria	Cross-scale rockmass characterization by high resolution seismic imaging around tunnels <b>Dr. Calin Cosma</b> , Vibrometric, Finland	Cavern Thermal Energy Storage – The future of heating cities <b>Teemu Routa</b> , AFRY Finland Oy, Finland	Identifying parameters with high impact on the swelling of clay-sulfate rocks using coupled HM modeling and machine learning approaches <b>Dr. Reza Taherdangko</b> , TU Bergakademie Freiberg, Germany

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13:30	<b>SESSION 17</b> <b>GEOLOGICAL DISPOSAL OF SPENT NUCLEAR FUEL 1</b>	<b>SESSION 18</b> <b>ROCK SUPPORT 1</b>	<b>SESSION 19</b> <b>JOINTED ROCK MASS BEHAVIOUR</b>	<b>SESSION 20</b> <b>GEOPHYSICS IN ROCK MECHANICS</b>
Chair:				
13:30	Clay-rock fracturing risk assessment under high gas pressures in repository systems <b>Dr. Mostafa Mollaali</b> , Helmholtz Centre for Environmental Research, UFZ, Leipzig, Germany	Simulation of wire mesh bearing capacity using the distinct element method (DEM) <b>Rodrigo Winderholler</b> , Rock Mechanics Consulting Finland, Finland	Detection of geometric properties of discontinuities on the Špičunak rock slope (Croatia) using high-resolution 3D Point Cloud generated from Terrestrial Laser Scanning <b>Hrvoje Lukačić</b> , University of Zagreb, Croatia	Analysis of the Permeability Change Resulting from Active Mineral Precipitation in Pores of Rocks by 3D-DEM <b>Arkin Eldan</b> , Kumamoto University, Japan
13:45	Numerical Approach to Evaluate the Influence of Water Saturation on the Strength of Neogene Tuff in Utsunomiya city, Japan <b>Neranjana Ranaweera</b> , Saitama University, Japan	A Multimodel Bayesian Reliability Analysis for a Rock Slope to Counter Data Insufficiency <b>Akshay Kumar</b> , Research Scholar at Indian Institute of Technology Kanpur, India	Explicit numerical models for the prediction of plastic and weakening rockmass behaviour around a circular tunnel in isotropic and anisotropic stress conditions <b>Caitlin Fischer</b> , Queen's University, Canada	Some thoughts on rock slope stability issues in Mars <b>Prof. Ömer Aydan</b> , University of the Ryukyus, Japan
14:00	Estimation of site-specific disposal spacings of high-level radioactive waste repository in South Korea based on geothermal gradient and rock mass properties. <b>Dr. Kwang-Il Kim</b> , Korea Atomic Energy Research Institute, Republic of Korea	Stability analysis of tunnel composite liner using convergence-confinement method and support capacity diagram – A case study of the Notog railway tunnel in Indonesia <b>Dr. Simon Prasetyo</b> , Institut Teknologi Bandung, Indonesia	The rock mass and the development of joints during the tunnel excavation <b>Prof. Wagdi Y</b> , Central University of Venezuela, Venezuela	Development and verification of a long distance survey ahead of the tunnel face using excavation blasting as seismic source <b>Dr. Masahito Yamagami</b> , Taisei Corporation, Japan
14:15	TBA <b>Dr. Lauri Uotinen</b> , Aalto University, Finland	The effectiveness of epoxy coating for preventing microbially induced corrosion of rock bolts <b>Dr. Hamed Lamei Ramandi</b> , School of Minerals and Energy Resources Engineering, UNSW Sydney, Australia	Identifying the "unidentifiable" contributors to large-scale instability experienced at a UG2 mine along the Western Limb of the Bushveld Complex <b>Shaune Liebenberg</b> , Sibanyestillwater, South Africa	Experimental study on the effect of changes in pore water pH on friction coefficient of rock <b>Hinako Hosono</b> , Nihon University, Japan
14:30	Analysis and determination of the stress field at the Olkiluoto site <b>Dr. Bruno Figueiredo</b> , Itasca Consultants AB, Sweden	Design of falling rock preventive countermeasure based on three-dimensional simulation <b>Hiroaki Kitauchi</b> , Okayama University, Japan	Influence of Geological Conditions on the Design and Construction of the Carlberg Main Tunnel. A case study in large railway tunnel in Moss (Norway), with low rock overburden in an urban area near deposits of sensitivity material. <b>Francisco Planells Valero</b> , Acciona Ingenieria, Spain	Application of the shear-tensile source model to acoustic emissions induced by uniaxial loading of Westerly granite <b>Dr. Matej Petruzalek</b> , Institute of Geology of the Czech Academy of Sciences, v.v.i., Czech Republic
14:45	Experimental hydraulic fracturing of CO <sub>2</sub> claystone through thermal pressurization <b>Dr. Philipp Braun</b> , Ecole des Ponts ParisTech, CNRS, France	Cost-effectiveness of road slope stabilisation <b>Ellen Robson</b> , Newcastle University, United Kingdom	Blominmäki wastewater treatment plant's sewage tunnels: Challenging connection of a vertical shaft to the existing operating offshore tunnel. <b>Ioannis Konstantas</b> , Kalliosuunnittelu Oy Rockplan, Finland	Monitoring Fracture Saturation using Transportable Acoustic Sources and a Neural Network Differential Autoencoder <b>Prof. David Nolte</b> , Purdue University, USA

15:00 **COFFEE, EXHIBITION, NETWORKING & POSTER SESSION** EXHIBITION AREA

15:30	<b>SESSION 21</b> <b>GEOLOGICAL DISPOSAL OF SPENT NUCLEAR FUEL 2</b>	<b>SESSION 22</b> <b>ROCK SUPPORT 2</b>	<b>SESSION 23</b> <b>FIELD AND LABORATORY INVESTIGATIONS 5</b>	<b>SESSION 24</b> <b>ROCK ENGINEERING AND MINING EDUCATION</b>
Chair:				
15:30	TOUGH-3DEC: a three-dimensional discontinuum-based simulator for coupled thermo-hydro-mechanical analysis <b>Dr. Saeha Kwon</b> , Korea Atomic Energy Research Institute, Republic of Korea	Rational Design Concept for Inverted Arch Structure for Mountain Tunnel <b>Takuto Natsume</b> , Tokyo metropolitan university, Japan	Terrafame Slope Stability monitoring: the integration between GNSS, ground-based and satellite InSAR <b>Aki Ullgren</b> , Terrafame Oy, Finland	The Allegory of the Rock Engineering Cave <b>Dr. Davide Elmo</b> , University of British Columbia, Canada
15:45	A numerical study on THM coupled behavior in the high-level radioactive waste disposal system <b>Dr. Taehyun Kim</b> , Korea Atomic Energy Research Institute, Republic of Korea	Laboratory study of the behaviour of grouted cable bolts under static and dynamic axial loading <b>Sina Anzpour</b> , University of Wollongong, Australia	Prediction of Blast Vibration Coefficients of Rockmass for the Unknown Cases from the Vibration Records <b>Dr. Myung Kyu Song</b> , Hyundai E&C, Republic of Korea	Data Preparation for Machine Learning in Rock Engineering <b>Beverly Yang</b> , University of British Columbia, Canada
16:00	An interpretation of the fracture open fraction distribution in Forsmark (Sweden) as the result of fracture reactivation by fluid overpressures <b>Dr. Philippe Davy</b> , Univ Rennes, CNRS, Geosciences Rennes, France	An empirical review of the effect of pre-support cablebolt installation on overbreak in Long Hole Open Stopes (LHOS) at Tara Mines <b>Marta Diaz Losas</b> , Tara Mines, New Boliden, Ireland	Experimental study on fracture processes of granite cylinders with different decoupling conditions <b>Yang Qiao</b> , University of Oulu, Finland	An example of digital field training for a diversity-friendly (and pandemic-proof) field education in geoenvironmental disciplines <b>Julia Godlewska</b> , Ruhr-University Bochum, Germany
16:15	Understanding and predicting stress fluctuations induced by multiscale fracture networks in naturally fractured rocks <b>Dr. Caroline Darcel</b> , Itasca Consultants s.a.s., France	Tunneling in heterogeneous ground: an update of the PBE code accounting for the uncertainty in estimates of block quantities from site investigations <b>Dr. Maria Lia Napoli</b> , Politecnico di Torino, Italy	Experimental assessment of dynamic loading response of grouted non-persistent joint rock <b>Sachin Kumar</b> , Indian Institute of Technology Kanpur, India	Comparison of different methods to characterise the abrasivity potential and mechanical properties of carbonates with respect to its relevance for practical purposes in excavation technologies <b>Moritz Aderhold</b> , Ruhr-University Bochum, Germany

16:45 **CLOSING SESSION**

Chair:

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# Posters

A brief review of the effect of wildfires on rockfall occurrence  
**Dr. Ignacio Pérez-Rey, Laboratorio de Geotecnia, CEDEX, Spain**

A Methodology for the Analysis of Tunnel Intersections Using Two-dimensional Numerical Modeling  
**Dr. Davide Elmo, University of British Columbia, Canada**

A methodology for road cutting design guidelines  
**Ellen Robson, Newcastle University, United Kingdom**

A new experimental device developed to study the creeping behavior of a rock joint under shear stress  
**Sophie Jung, Ecole Nationale des ponts et chaussées, France**

A Numerical Investigation on the Effect of Screen Size on the Sand Production Issue in the Oil Wells  
**Dr. Yashwanth Kumar Gujjala, Sejong University, Republic of Korea**

A review on the application of cohesive zone model in hydraulic fracturing  
**Dr. Xuejiao Li, China University of Petroleum, China**

A study on the characteristics of deep bedrock of Korea's representative rock types for HLW geological disposal  
**Dr. Dae-Sung Cheon, Korea Institute of Geoscience and Mineral Resources, Republic of Korea**

An experimental study on division of fracture ligament and evolution of fracture process zone in sandstone  
**Yang Qiao, University of Oulu, Finland**

An issue in the current definition of the factor of safety for rock slopes and suggestions for improvement  
**Dr. Are Håvard Høien, Norwegian Public Roads Administration (NPRA), Norway**

Analysis of Fault reactivation and surface ground behavior around the geological repository of HLW  
**Eunjin Seo, Seoul National University, Republic of Korea**

Assessment of risk of Global slope failure along the right bank of Koteshwar Dam reservoir: An integration of Geomatic and Geotechnical approaches  
**Anil Kumar Padoni, THDC India Limited, India**

Biaxial Loading of Brazilian Disc Samples  
**Dr. Mehdi Serati, The University of Queensland, Australia**

Characterisation of Fine Particles Generated at Draw Points During Sub-Level Cave Mining for Assessment of Mud Inrush Hazard  
**Dr. Matthew Musolino, Oz Minerals, Australia**

Close-range photogrammetry for rock mass characterization and risk assessment  
**Dr. Mateusz Janiszewski, Fractuscan Ltd, Finland**

Design of pin-on-disk type abrasion testing machine for wear assessment of rock cutting tools  
**Mun-Gyu Kim, Kyungpook National University, Republic of Korea**

Determination of rock mass quality using seismic p-wave velocities at Chenab bridge, Jammu & Kashmir, India  
**Dr. Butchi Babu B, National Institute of Rock Mechanics, India**

Effect of anisotropic creep on the convergence of deep drifts in Callovo-Oxfordian claystone  
**Sophie Jung, Ecole Nationale des ponts et chaussées, France**

Effect of anisotropy of fracture surface on fluid flow  
**Masoud Torkan, Aalto University, Finland**

Effect of anisotropy on the hydro-mechanical coupled behavior of a metamorphic rock mass  
**Prof. Meng-Chia Weng, National Yang Ming Chiao Tung University, Taiwan**

Effects of initial stress and spalling strength on spalling around deposition holes and tunnels  
**Dr. Bruno Figueiredo, Itasca Consultants AB, Sweden**

Empirical mode decomposition approach to simplify the fracture roughness for numerical models  
**Masoud Torkan, Aalto University, Finland**

Evaluation of surface roughness of rock-like joints using close range photogrammetry method  
**Masoud Torkan, Aalto University, Finland**

Exposing the rockmass response by means of radar technologies  
**Paul Couto, University of Pretoria, South Africa**

Experimental study of aging-induced cementation effect on permeability property of bentonites  
**Daichi Ito, Waseda University, Japan**  
Fluid flow of various configurations in a rock-proppant-system  
**Lucas Conrad Witte, Ruhr University Bochum, Germany**

Geomechanical characterization and analysis of the influence of durability tests on metabasalts  
**Dr. Eduardo Marques, Federal University of Viçosa, Brazil**

Geotechnical Characterization of an Amphibolite from Baixada Santista – Sp, Brazil  
**Dr. Eduardo Marques, Federal University of Viçosa, Brazil**

Intact rock deformation bimodularity: an experimental study  
**Dr. Mauro Muñiz-Menéndez, Laboratorio de Geotecnia, Spain**

Interpretation of changing pore pressure on heated unsaturated/saturated bentonite-sand mixture  
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Investigation, numerical model, and monitoring for Follo line - a metro project in Oslo  
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Management of contaminated water at the Sulkavuori Wastewater Treatment Plant during the excavation phase  
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Morphological and physical-mechanical characterization of a syenogranite weathering profile developed on tropical climate  
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Numerical modelling of Uniaxial Compressive Strength (UCS) laboratory tests  
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Numerical simulation of rock cutting performance of a 130t Roadheader  
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Predicting rockburst damage scale in seismically active mines using a classifier ensemble approach  
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Riskcoast: a south european approach for coastal landslide hazard: presentation and French results  
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Static and Dynamic Stability of Rock Boulders on Slopes  
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Thermally induced shear reactivation of critically-stressed smooth and rough granite fractures  
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Verification of Spalling Tensile Strength of Rocks using 3D GPGPU-accelerated Hybrid FEM/DEM  
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Vertical Well Assisted Hydraulic Fracturing in Mudstone Interlayer of Terrestrial Ultra-heavy Oil Reservoir  
**Qiqi Wang, China university of Petroleum, China**

Virtual reality learning system for remote rock mass mapping  
**Dr. Mateusz Janiszewski, Aalto University, Finland**

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