WEDNESDAY, OCTOBER 11

MOZART HALL

02:15 p.m.	Current Situation of and Prevention Measures for Rock Burst of Coal Mines in China Dechang ZHOU
02:45 p.m.	Application of a new brittleness index to estimate the proneness to brittle failure of rock around a deep tunnel Lorenzo MILAN, Monica BARBERO, Mauro BORRI-BRUNETTO
***************************************	An investigation of the effect of rock brittleness on rockburst

prediction in seismically active mines

lexev SHARIPOV, Amoussou ADOKO Assessment of energy release and redistribution on excavation instabilities for underground mining

Yang ZOU, Ping ZHANO An implicit numerical modeling approach for destress blasting design optimization for tunneling and mine development in high 03:30 p.m. stress conditions

Ali HASHEMI, Neda DADASHZADEH, Kathy KALENCHUK

Application of hydraulic fracturing for destressing mining-induced stresses in underground coal mines

Hongpu KANG, Yanjun FENG, Fuqiang GAO

A conceptual study on the prediction of destress blasting efficiency using geostatistical approaches

Experimental study of coal bursts caused by decrease of local mine

Fuqiang GAO, Guiyang YUAN, Xiangyuan PENG A modification of the nearest neighborhood triggering mechanism in longwall mining: do seismic events only triggered by its closest neighbors?

Xu LI, Guangyao SI, Joung OH, Ismet CANBULAT

04:30 p.m.	Novel method of multi-face destress blasting efficiency assessm Krzysztof FUŁAWKA, Piotr MERTUSZKA, Marcin SZUMNY, Lech STOLECKI, Izabela JAŚKIEWICZ-PROĆ
04:45 p.m.	Numerically simulated Rate of Energy Release and its correla with measured seismic potency Sound DEHKHODA David RECK Vladislay LEVKOVITCH

Numerical modelling of induced seismicity considering metre-scale stress heterogeneity in a fault damage zone

Modulated thermal wave imaging approach to detect subsurface microcracks and their coalescence in deep mines for rock burst

05:15 p.m. (strain burst) prediction Mritvuniav IAISWAL, Resmi SEBASTIAN, Ravibabu MULAVEESALA

A numerically based geomechanics risk assessment of the cut and

fill underground mining method 05:30 p.m. Kamilya OMIRZHANKYZY, Ali MORTAZAVI Origin of seismic repeaters in a deep mine: what do we learn

from in-situ investigation coupling geology, geomechanics and geophysics? 05:45 p.m. Emeline LHOUMAUD. Yann GUNZBERGER. Jannes KINSCHER.

Marianne CONIN

Development of failure criterion for extensile fracturing of Kannur

limestone under triaxial stresses Arpan NANDY, K Seshagiri RAO, Tanusree CHAKRABORTY Mechanical and fracturing characteristics of defected cement

mortar samples under biaxial confinements Pengxuan JI, Qianbing ZHANG, Gisela VIEGAS

Reliability of Predicting damage in hard rock mass around deep

tunnels in terms of its convergence

Coupled Geomechanical CFD Modelling of Goaf under Goaf Gas Drainage: Impact of Goaf Characteristics

EUROPA HALL

OPENING CEREMONY

08:30 a.m.	Prof. Wulf Schubert, Congress chairperson, & President of the Austrian Society for Geomechanics
08:35 a.m	Dr. Florian Kreibich, Municipal Councillor City of Salzburg
08:40 a.m.	Prof. Resat Ulusay, ISRM President
08:45 a.m.	Prof. Chungsik Yoo, President of FedIGS
08:50 a.m.	Cultural moment
09:00 a.m.	"The status of the ISRM" by the Secretary General
09:15 a.m.	Keynote Lecture by Prof. Christian Hellmich
	COFFEE BREAK
10:30 a.m.	Rocha Medal Award and Lecture
11:05 a.m.	Müller Award
11:55 a.m.	Fellows' induction ceremony
12:15 a.m.	FedIGS Lecture by Vassilis Marinos
	ROCK BOWL + LUNCH BREAK

Sponsors contribution DSI by Robert Penczek

CHALLENGING ROCK ENGINEERING PROJECTS (T01) Chair: Nedim RADONČIĆ, Karoline PRALL

Burgenland's first tunnel takes its tribute - geotechnical retrospective of a tunnel collapse 02:15 p.m. homas PILGERSTORFER, Katharina HOFER, Yvonne MONSBERG-

ER, Jürgen VORINGER Collapse mechanism and treatment technology of large-span soft rock highway tunnel Shikang QIN, Chen XU, Xichen LI, Yabin HUANG, Qing YAO

Pandoh Highway Tunnels in Indian Himalaya - a rock mechanical challenge in design and construction

03:00 p.m. Vojkan JOVIČIĆ, Boštjan VOLK, Gregor VESEL, Jože RATEJ, Markus SCHMIDT 50 km of Tunnels in Inner-City Areas – Rock Mechanics and

Tunnelling in Slovenian Dinaric karst: challenges and solutions

Tunneling Issues in Connection with the large-scale Railway Project Stuttgart 21 – A Success Story Walter WITTKE, Martin WITTKE, Patricia WITTKE-GATTERMANN, Bettina WITTKE-SCHMITT

Soil-structure interaction of preliminary deformable lining for conventional tunnel in squeezing conditions using HiDSte elements Lorenzo BATOCCHIONI, Valeria GONZALEZ RODRIGUEZ, Salvatore

Complex tasks to evaluate the feasibility of two railway tunnel variants in terms of tunnel construction

Theory and practice in the boulders and rock blocks blasting in urban areas applied to civil engineering activities

Lineu Azuaga AYRES DA SILVA, Guilherme Gianotti de ANDRADE, Anna Luiza Margues AYRES DA SILVA. Fábio ZATZ

COFFEE BREAK

CHALLENGING ROCK ENGINEERING PROJECTS (T01) Chair: Nedim RADONČIĆ, Karoline PRALL oom: Europa Hall (2nd upper floor)

Brenner Base Tunnel: three DS-TBMs excavating in parallel under the Alps in Italy – Findings, difficulties and achievements from a geological-geotechnical point of view

Stefan SKUK, Harald EGGER, Emanuele BARNABEI, Umberto Marco CONTI, Giuseppe FODERÀ, Gianluca LIUZZI, Gianluca MAGGIO, Davide RENGHI, Antonio SPAZIANI, Antonio VOZA

Performance of different diameter Double Shield TBMs: experiences from the excavation of exploratory tunnel and main tubes of the Italian lot Mules 2-3 - Brenner Base Tunnel Harald EGGER, Marco Giuseppe FODERÀ, Gianluca LIUZZI, Antonio SPAZIANI Antonio VOZA Daniela BOI DINI

Semmering Base Tunnel (SBT) - current state of the project 05:00 p.m. Gerhard GOBIET, Gernot NIPITSCH, Oliver Kai WAGNE

Semmering Base Tunnel – Geotechnical challenges at crossing a fault system in combination with high water pressure 05:15 p.m. Mario HEIN, Zafer EKICI, Christine PEINTNER, Robert HOLZER, Thomas HOFMANN

Challenges faced and mitigation measures adopted in construction of head race tunnel of Kameng hydro electric project (600 MW), Arunachal Pradesh, India Raianish RANIAN Girish KALL

Advancements in drillability prediction for conventional hard rock drill and blast tunnelling - implementing automation into the 05:45 p.m. Tanja SATTLER, Kurosch THURO

Design of controlled rock blasting for tunneling and tunnel portals Lineu Azuaga AYRES DA SILVA, Anna Luiza Marques AYRES DA SIL VA, Guilherme Gianotti de ANDRADE, Geronimo Lima RODRIGUES

Extensive sensitivity analysis of the Kivenlahti metro center using

Oskar Leonard VAN DER WEIJ, Daniele MARTINELLI

TRAKL HALL

COMPARISON OF INTERNATIONAL TUNNELLING CONTRACTS (TO2) **NATM VERSUS TBM (T11)**

Probabilistic Analysis of the Delivery Models Unit Price and Alliance applied at the Project Gemeinschaftskraftwerk Inn with Focus on the Construction Time Carl Philipp FRIEDINGER, Klaus MITTEREGGER, Philip SANDER Case Histories of contractual management of geological risks

Davide MERLINI, Daniele STOCKER, Matteo FALANESCA, Matthias

NEUENSCHWANDER Cutting performance evaluation of Actuated Disc Cutting by linear cutting test 02:45 p.m. Hoyoung JEONG, Yudhidya WICAKSANA, Sehun KIM, Seokwon

JEON, Jeong-Gi UM Compression test of TBM thrust jack for validation of bucking strength under inclined loading condition

Han-Young JEONG, Mun-Gyu KIM, Yun-Joo NAM, Min-Gi CHO, Jung-Woo CHO, Sung-Bo SHIM Performance validation of rock cutting-splitting method by scaled

model tests and rock slope excavation Mun-Gyu KIM, Han-Young JEONG, Joo-Young OH, Jung-Woo CHO Sang-Hwa YU, Ho-Young JEONG

COFFEE BREAK

EARLY CAREER FORUM (YOUNG RESEARCHERS) (T18) Chair: Vojkan JOVIČIĆ, Reșat ULUSAY, Yang QIANG Room: Trakl Hall (3rd upper floor)

Some thoughts on Rock Mechanics and Rock Engineering in Mars 04:30 p.m. How to form competent rock engineers 04:55 p.m. Michael ALBER, Leandro ALEJANO, Tobias BACKERS

Experimental assessment of high temperature-induced changes on frictional behavior of planar rock joints 05:15 p.m Gustavo André PANEIRO, Ignacio PÉREZ-REY, Xian ESTÉVEZ-VEN-

Stability analysis of a rock slope: Fully-probabilistic approach

Application of empirical rockfall classification methods to risk management in an Alpine valley road Maria Teresa CARRIERO, Maria Rita MIGLIAZZA, Claudio SCAVIA, Leandro R. ALEIANO

A study on the correlation between Hoek-Brown mi constant and Brinell hardness of intact rocks Anastasios TSIKRIKIS, Vassilis MARINOS, Theodosios PAPALIANGAS

Mechanical behavior of granitic rocks under elevated temperatures: implications for underground radioactive waste disposal safety and tunnelling

Andor NÉMETH, Ákos TÖRÖK

Skavica Hydropower plant, one of the most important energetical projects to be constructed in Albania Ardita MALAJ, Skender ALLKJA, Iljana KERO, Julian BELLIU, Besian XHAGOL

DOPPLER HALL

DEEP GEOTHERMAL ENERGY (T03) Chair: Kurosch THURO, Klaus VOIT Room: Doppler Hall (4th upper floor)

Informing deep geothermal reservoir rock mass properties from drilling data - experience from Krafla, Iceland Marlene VILLENEUVE, Ben KENNEDY, Anette MORTENSEN, Elodie SAUBIN, Aliaa HAMMOUD Relationship between thermal conductivity and porosity in sedimentary soft rocks by an experimental approach Weiren LIN, Osamu TADAI Borehole stability in geothermal reservoirs – A combined laboratory and numerical approach Justin MATTHEIS, Catharina DREXL, Martin POTTEN, Georg Maximilian STOCKINGER, Kurosch THURO Induced fracture analysis from microseismic catalogues: Salton Sea EGS case study Juan Miguel REYES-MONTES Carbon dioxide (CO2) fracturing of volcanic rocks under geothermal Kohei TAKUMA, Yuto WATANABE, Kiyotoshi SAKAGUCHI, Kazumi

OSATO, Amane TERAI, Noriaki WATANABE Correlations between thermal properties and elastic wave velocities of volcanic rocks

Shuai FENG, Weiren LIN, Susumu SHIBUTANI, Terasu SANO, Nana Influence of stress state based on hydraulic-mechanical coupling

and water loading path on fault activity Yujie ZHU, Chen XU, Yingguo HU, Xiaoli LIU, Enzhi WANG

Stress and seismicity related to cooling of geothermal wells Arno ZANG, Hannes HOFMANN, Gergö HUTKA, Bakul MATHUR, Mauro CACACE, Serge SHAPIRO, Beau WHITNEY, Cedric DUVAIL, Ramon Secanell GALLART, Niels GROBBE, Annemarie MUNTENDAM-BOS

Design of CaO-Al2O3-SiO2-H2O hydrothermal synthesis systems for high temperature and high pressure applications Chuangchuang WANG, Xueyu PANG, Guodong CHENG, Jiankun QIN,

COFFEE BREAK

UNDERGROUND STORAGE FOR LIQUID AND GASEOUS MEDIA (T16)

Mechanical stability of a salt cavern used for hydrogen storage Hippolyte DJIZANNE, Benoit BROUARD, Grégoire H Numerical Modelling of Induced Seismicity along a Fault during CO2 Injection into a Subsurface Reservoir James Edward John BURTONSHAW, Adriana PALUSZNY, Robert

Large rock caverns for heat storage in district heating networks – A comparative study for the city of Salzburg Sophie MESSERKLINGER, Mikkel SMAADAHL, Daniel PÖTSCH, Carlo

RABAIOTTI, Erich SAURER What can be the future of underground storages in the context of green energy? - Geomechanical aspect

ilippe VASKOU, Nicolas GATELIEF

Hybrid CO2 based thermo-mechanical underground energy storage - a numerical geomechanical review Daniel Hubert BÜCKEN, Tobias BACKERS

A guidance for the optimal site location of Cavern Thermal Energy Storage (CTES) Stefan ZELZER, Thomas GEISLER, Thomas MARCHER

Thermomechanical Behaviour of Rock Salt Sasan MORAVEJ, Mehdi SERATI, Mojtaba BAHAADDINI, David WIL-

The fracture behavior of rock salt under present gas pressure in mechanical extension experiments Experimental study on creep behavior of rock salt under comple

> stress paths Zongze LI, Jinyang FAN, Marion FOURMEAU, Chao DU, Deyi JIANG,

THURSDAY, OCTOBER 12

PAPAGENO HALL	MOZART HALL	EUROPA HALL	TRAKL HALL	DOPPLER HALL
NUMERICAL METHODS IN ROCK ENGINEERING (T13) Chair: Helmut F. SCHWEIGER, Daniela BOLDINI	ROCK SLOPE ENGINEERING (T17) Chair: Alexander PREH, Johann Thomas SAUSGRUBER	ROCK AND ROCK MASS PROPERTIES (T15) Chair: Andreas GORICKI, Thomas FRÜHWIRT	LONG-TERM BEHAVIOUR OF UNDERGROUND STRUCTURES (T09) Chair: Bernd A. MORITZ, Thomas PILGERSTORFER	MONITORING (T10) Chair: Werner LIENHART, Urs H. GRUNICKE
Room: Papageno Hall (ground floor) Modelling brittle rock mass behaviour in deep underground exca-	Room: Mozart Hall (ground floor) Activity and kinematic behaviors of gravitational slope deforma-	Room: Europa Hall (2nd upper floor)	Room: Trakl Hall (3rd upper floor)	Room: Doppler Hall (4th upper floor)
08:30 a.m. vations Giuseppe CAMMARATA, Davide ELMO, Sandro BRASILE	08:30 a.m. tion in the slate belt of Taiwan Cheng-Han LIN, Ming-Lang LIN	08:30 a.m. Physical Modeling in Rock Mechanics and Rock Engineering Herbert H. EINSTEIN	Data and analytical mechanics: a new look on NATM tunnels 08:30 a.m. Raphael SCHARF, Bernhard PICHLER, Roman HEISSENBERGER, Bernd MORITZ, Christian HELLMICH	Distributed Fiber Optic Monitoring Systems in Tunneling: Implementation from research into practice O8:30 a.m. O8:30 a.m. Christoph Martin MONSBERGER, Fabian BUCHMAYER, Werner
Anisotropy Effects on the Response of Deep Tunnels Excavated in Claystone	The influence of a heavy storm on a slope subject to rockfall phenomena: the Bazena case study	09:00 a.m. The Interplay between Geometry and THMC Processes Mengsu HU, Laura PYRAK-NOLTE	Investigating the impact of viscoelastic material models for accurate stress estimation in precast concrete tunnel segments	Development of tunnel pre-displacement measurement method
Miguel Angel MANICA, Antonio GENS, Jean VAUNAT, Gilles ARMAND, Minh-ngoc VU	08:45 a.m. Battista TABONI, Gessica UMILI, Anna Maria FERRERO, Simone BLANC, Filippo BRUN, Stefano BRUZZESE, Luca M. ALBERTELLI, Iuri D. TAGLIAFERRI	Flow simulation in digital rough fractures by considering anisotro- 09:15 a.m. pic roughness and geometrical combinations Xunhui XU, Weiren LIN, Han BAO, Peijie YIN	08:45 a.m. Ali RAZGORDANISHARAHI, Maximilian SORGNER, Adolf Bernd MORITZ, Thomas PILGERSTORFER, Bernhard L.A. PICHLER, Christian	08:45 a.m. by fiber optic sensing Kazuo SAKAI, Toshifumi AKAKI, Yoshimi OHNISHI, Shigeru TANAKA,
Numerical investigation of the behaviour of underground strata reinforced with polymer liner, steel mesh and bolts subjected to buckling failure	Rock slope stability management along the road by machine learning through databasing disaster prevention records	A modification of nonlinear Forchheimer's coefficient for fracture 09:30 a.m. flow during shear	Dissolution and precipitation processes governing the hydration	Tomonori HORIDOME Long-term monitoring of Austrian railway tunnels – A next step
Saurav KARN, Ian PORTER, Shivakumar KAREKAL Analyzing numerical grouted rockbolt behaviour in jointed pseu-	09:00 a.m. Hiroyuki HONDA, Yasuhiro MITANI, Hisatoshi TANIGUCHI, Ibrahim DJAMALUDDIN, Yurino KAWAURA	Min GAO, Xu ZHU, Chengguo ZHANG, Joung OH Temperature-dependent strength of ice-filled discontinuities in	heat development in tunnel cements: Green's function-based esti- 09:00 a.m. mation of heat release in modified calorimetric tests Hermann HÖLD, Bernhard PICHLER, Helmut RECHBERGER, Philipp	09:00 a.m. forward Adolf Bernd MORITZ, Johannes FLECKL, Werner LIENHART, Johann GOLSER, Thomas PILGERSTORFER
09:15 a.m. do-discontinuum models Caitlin FISCHER, Mark DIEDERICHS	Discontinuum modelling of slope instability as a support tool for risk management	09:45 a.m. frozen and thawing rock masses Greg GAMBINO, John P. HARRISON	ASCHENBRENNER, Christian HELLMICH Effects of water on the time dependent properties of rock	Sinkholes and underground mining activities: the key role of mon- itoring for the hazard assessment and mitigation
On advanced numerical techniques for the modeling of bolt reinforced rock mass Tuan Anh BUI, Giuseppe CAMMARATA,	Marco BARLA, Santina AIASSA, Francesco ANTOLINI, Alessandra INSANA, Andrea PERINO	Temperature- and pressure-dependent dynamic and static elastic moduli	09:15 a.m. Kimihiro HASHIBA, Katsunori FUKUI Time-dependency and long-term strength of rocks in brittle under-	09:15 a.m. Bartolomeo VIGNA, Adriano FIORUCCI, Federico VAGNON, Marco BARALE
Varun Choudary KANCHARLA, Ronald BRINKGREVE, Sandro BRA- SILE	The Correct Way to use the Hoek-Brown Strength Criterion for 09:30 a.m. Slope Stability Analysis on the Example of Vals (Tyrol/Austria) Mariella ILLEDITSCH. Alexander PREH. Johann Thomas SAUSGRUBER	Jian YANG, Li-Yun FU Low-temperature Thermal diffusion in Rock	ground environments – from the lab results to numerical continuum 09:30 a.m. analysis	Next-generation high-resolution borehole tensor strainmeters for the measurement of six strain-components based on fully au-
Modeling of joints of segment linings under complex relation be- 09:45 a.m. tween lining and ground conditions Kyeunghye AHN, Amade POUYA, Gye-Chun CHO	Interaction between tunnels and slopes. Analysis of weak rock masses considering the Hoek-Brown failure criterion	Zhiqiang LIU, Linlin WANG, Shihui YU Physical-mechanical properties of a granite used in the UNESCO	Chrysothemis PARASKEVOPOULOU, James INNOCENTE, Mark MC- DONALD, Mark DIEDERICHS	Jiayong TIAN, Kanghua ZHANG, Jiashu LOU
Consideration of Creep Deformation in Deep Underground Gallery 10:00 a.m. Excavation in Claystone	09:45 a.m. Carlos Luis GARRIDO GARRIDO, Sergio SÁNCHEZ RODRÍGUEZ, Paula DEL POZO GARCÍA	World Heritage of the north of Portugal after high-temperature pretreatment Roberto TOMÁS, Miguel CANO, Luis F. PULGARÍN, Vicente BROTONS,	Numerical simulation of nuclide transport at the underground re- pository scale subjected to thermal loading Jintong ZHANG, Zhihong ZHAO, Junyu CHEN, Xingguang ZHAO, Ju	Analysis of the evolution of a reclaimed coal mining area using historical aerial photographs Roberto SARRO, Juan LÓPEZ-VINIELLES, Adrián RIQUELME, Mónica
Richard WITASSE, Jean-Francois BRUCHON, Sebastien BURLON COFFEE BREAK	Capturing the roughness of discontinuity traces in the field with high accuracy: the effect of photograph resolution	David BENAVENTE, Tiago MIRANDA, Graça VASCONCELOS Thermal degradation study of Westerly granite by ultrasonic	WANG Creep induced tunnel collapse during construction – a case study of	MARTÍNEZ-CORBELLA, Juan Carlos GARCÍA-DAVALILLO, Augusto RO- DRÍGUEZ, José Antonio FERNANDEZ-MERODO, Ángela SUÁREZ-RO- DRÍGUEZ, Mario HERNÁNDEZ, Rosa María MATEOS, Mercedes FERRER,
NUMERICAL METHODS IN ROCK ENGINEERING (T13)	Clarence BUTCHER, Olivier BUZZI, Anna GIACOMINI, Robert BER- TUZZI, Vaughan GRIFFITHS	sounding and mercury porosimetry Tomas LOKAJICEK, Daniela RIMNACOVA, Richard PRIKRYL, Ali	a mountain railway tunnel in Taiwan Wen-Jie SHIU, Fu-Yuan HSIAO, Cheng-Hsien TSAI, Shih-Hui WANG	Joaquín MULAS
Chair: Helmut F. SCHWEIGER, Daniela BOLDINI Room: Papageno Hall (ground floor)	Use of representative values of geometrical properties of disconti- nuities in rock slope verifications according to EC7 Javier GONZÁLEZ-GALLEGO, José ESTAIRE, María SANTANA	AMINZADEH, Matej PETRUZALEK Influence of grain-size on damage in thermally treated granites- A	Coupled thermo-hydraulic-mechanical analysis for a high efficiency high-level radioactive waste repository in South Korea	First experience with the newly created monitoring system of dy- namics of surface changes occurring during the transition into the post-mining stage
FDEM modelling of hydraulic fracturing in jointed rocks 10:45 a.m. Mansour SHARAFISAFA, Zeinab ALIABADIAN, Akira SATO, Luming	Effect of blast damage zones on the stability of a Himalayan highway cut-slope continuum modelling approach	Review and Novel quantification techniques Rahul Rooplal KATRE, Nikhil Ninad SIRDESAI, Sandeep PANCHAL	Kwang-II KIM, Changsoo LEE, Dong-Keun CHO Laboratory measurement by geotechnical centrifuge of long-term	Vlastimil KAJZAR, Eva JIRANKOVA, Petr KONICEK Usage of Monitoring Data to Optimize and Validate the Geotech-
SHEN Numerical modelling of the swelling of clayey geomaterials by a	Som NATH, Ashok Kumar SINGH, Harsh Kumar VERMA, Nachiketa RAI Evaluation of weathering effects by CIELAB color space and image	Point Load Strength Index of a limestone exposed to high tempera- tures and correlation with uniaxial compressive strength María Elvira GARRIDO, José B. SERÓN-GAÑEZ, Víctor MARTÍNEZ-	behavior in a model of vertical emplacement concept with tunnel at a deep geological disposal repository Soshi NISHIMOTO	nical Parameters of Rock Properties in the Underground Space Ghader SAADATI, Michael METT, Kontrus HEINER, Barbara SCHNEIDER-MUNTAU
11:00 a.m. multiscale approach Hamza MHAMDI ALAOUI, Richard GIOT, Dimitri PRÊT, Philippe COSENZA, Stephen HEDAN	analysis technique for interbedded metasedimentary rock in the northern region of Peninsular Malaysia Mazlina RAZALI, Mohd Ashraf MOHAMAD ISMAIL, Sharan Kumar	IBÁÑEZ, Carlos HIDALGO-SIGNES, Roberto TOMÁS, Martina-Inmaculada ÁLVAREZ-FÉRNANDEZ	COFFEE BREAK	Optimization of a large-scale slope monitoring system by the correlation between interferometric radar and geological com-
11:15 a.m. A numerical modelling study of the effect of pillar shape on pillar strength Jan Abram MARITZ, Daniel Francois MALAN	NAGENDRAN, Zuraini ZAINAL, Hayato TOBE, Kensuke DATE, Yasuhiro YOKOTA, Hamzah HUSSIN	Modified transient plane source measurements of Olkiluoto migmatite	LONG-TERM BEHAVIOUR OF UNDERGROUND STRUCTURES (T09) Chair: Bernd A. MORITZ, Thomas PILGERSTORFER	partmentalization Miguel PAGANIN NETO, Elder Lucas RIBEIRO, Christiano NOGUEI-
11:30 a.m. Discussion	Latest developments to increase the quality of flexible rockfall protection barriers	Risto KIURU, Sophie HAAPALEHTO Variation in the drilling rate in thermally treated limestones through	Room: Trakl Hall (3rd upper floor) Long term behaviour based on a weakness planes approach: Con-	RA, João Pedro DELVEAUX, Wesley de Lima SILVA, Camilla Szerman EUZEBIO
Phase-field model of compressive and tensile fractures in ductile sandstone, calibrated by P wave velocity measurement and moment tensor inversion	Armin RODUNER, Helene LANTER, Manuel EICHER Slope safety assessment based on dynamic anchor force	penetration-time curves from Sievers' J-miniature drill test Víctor MARTÍNEZ-IBÁÑEZ, Carlos HIDALGO SIGNES, María Elvira GARRIDO, José Bernardo SERÓN GÁÑEZ, Roberto TOMÁS, Celestino	10:45 a.m. stitutive model and application to a Meuse/Haute-Marne (France) URL drift	COFFEE BREAK
Xu LI, Guangyao SI, Joung OH, Ismet CANBULAT Analysing the influence of finite deformations treatment towards	Zhibo JIA, Yan BAO, Lianjin TAO, Jin BIAN, Hu WEN, Haixiang ZHANG COFFEE BREAK	GONZÁLEZ-NICIEZA COFFEE BREAK	Mountaka SOULEY, Minh-Ngoc VU, Gilles ARMAND Influence of different support systems on drifts closure evolution in	MONITORING (T10) Chair: Werner LIENHART, Urs H. GRUNICKE Room: Doppler Hall (4th upper floor)
the safety assessment of nuclear waste repositories Steffen BEESE, Ralf EICKEMEIER, Jobst MASSMANN,	ROCK SLOPE ENGINEERING (T17)	ROCK AND ROCK MASS PROPERTIES (T15)	11:00 a.m. Callovo-Oxfordian claystone Frederico LARA, Lina-María GUAYACÁN-CARRILLO, Jean SULEM, Jana JABER, Jan CORNET, Gilles ARMAND	Monitoring and analysis of the behavior of the Salzburg-Clay
Sandra FAHLAND Evaluation of inclined loads in pillars stability	Chair: Alexander PREH, Johann Thomas SAUSGRUBER Room: Mozart Hall (ground floor)	Chair: Andreas GORICKI, Thomas FRÜHWIRT Room: Europa Hall (2nd upper floor)	Eighteen years of feedback on the mechanical behavior of a 500m	during the jet grouting works for the S-LINK project 10:45 a.m. Albert GREINMEISTER, Johann GOLSER, Alexander RADINGER, Gernot JEDLITSCHKA, Manfred EDER, Micheal FELDINGER, Franz
Edjan BUSTAMANTE, Edgar MONTIEL, Alexandra OSSA Simulation of the run-out and mobilized volume of a 3D rock slope	Developing a Digital Twin: A Semi-Brittle Slope Failure Case Study from Pueblo Viejo Gold Mine	Direct shear tests on large natural and artificially induced rock fractures in a new laboratory equipment	Jana JABER, Carlos PLUA, Minh-Ngoc VU, Gilles ARMAND, Jad ZGHONDI	RATHMAIR, Erich SAURER Strategy and application of slope monitoring over dam basin in
failure using the Material Point Method (MPM) Fabrício FERNÁNDEZ, Eurípedes VARGAS JR., Miguel PAGANIN NETO, Elder RIBEIRO, Christiano NOGUEIRA, Camilla EUZEBIO, Joao	10:45 a.m. Miosoty BAUTISTA, Juan Carlos COBIAN SALAS, Jessica LOPEZ, Neil BAR, Niccolò COLI, Francesco COPPI, Andreas GAICH, Markus PÖTSCH, Miriam BAUMGARTNER, Alison MCQUILLAN	Lars JACOBSSON, Mathias FLANSBJER, Jörgen LARSSON Physical modelling of bimrocks in large scale direct shear apparatus Miles J (OVANOVER) have B. PARIS has DEFINITION.	Evolution of spalling-inducing fractures around a deep geological repository for nuclear waste during glaciations and their effect on	11:00 a.m. regular periods and during emergencies using SAR and GNSS Shoji YUKIKO, Kikuchi TERUYUKI, Koike HITOSHI, Shimizu NORI-KAZU
NETO, EIGER RIBEIRO, CHRISTIANO NUGUEIRA, LAMIIIA EUZEBIO, JOAO DELVEAUX, Daniel MONTEIRO MACHADO, Claus NAVES EIKMEIER The accurate knowledge of the joint term for rock mass classifica-	Comparing different rock mass classifications using field and point 11:00 a.m. cloud data on a rock cut	Milorad JOVANOVSKI, Jovan Br. PAPIC, Igor PESHEVSKI A Study on Dynamic Shear Properties of Bimrock	11:30 a.m. the long-term repository stability M. Cristina SACEANU, Adriana PALUSZNY, Robert W. ZIMMERMAN, Diego MAS IVARS	Regression analysis of slope instabilities evolution for time of fail-
tion and for the numerical tunnels analysis and its impact on the on the reinforcement's costs	Dragana SLAVKOVIĆ, Aljoša MITIĆ, Miloš MARJANOVIĆ Sub-critical crack growth based time-dependent deformation	Effect of normal stress on dynamic friction weakening of granitic	Crush Pillars' Behaviour at Intermediate Depth on Merensky Reef 11:45 a.m. Hlomani Glen MTHOMBENI, Shane K. DURAPRAI, Richard T.	11:15 a.m. ure estimation Alberto MICHELINI Use of combined monitoring remote sensing techniques for the
Wagdi NAIME, Roque GARCÍA Application of empirical and numerical modelling for stability analy-	11:15 a.m. model and its application to open-pit slope stability Tao XU, Zhiguo LI, Tianhong YANG, Xiaobing ZHENG, Wancheng	11:30 a.m. rock joints under cyclic shear Kai ZHANG, Ling ZHU, Li CHENG, Qingchao LYU, Yaoru LIU	MASETHE Rehabilitation of old masonry tunnels – challenges and possibilities	Use of combined monitoring remote sensing techniques for the study of active fractures in a remote area: Case of Cima Del Si- 11:30 a.m. mano rockslide
sis of developmental workings in an underground coal mine Surajit SARKAR, Manoj Kumar TIWARI, Syed Shah Ghalib ASKARI, Indranil SAHA, Piyush SRIVASTAVA, D.B. Sundara RAMAM	ZHU, Tengfei FU A Parametric Study Illustrating the Effects of Moderately Aniso-	Elucidation of microscopic stress state within surface asperities of 11:45 a.m. a rock joint Bunyuu HASEGAWA, Sota HIGASHI, Atsushi SAINOKI	12:00 p.m. Tilman SANDNER, Claas MEIER, Boley CONRAD Self-sealing experiments with water and gas injection on Callo-	Charlotte WOLFF, Tiggi CHOANJI, Marc-Henri DERRON, Li FEI, Mi- chel JABOYEDOFF, Andrea PEDRAZZINI, Carlo RIVOLTA
Evaluation of trends in tunnel lining utilization with regard to the moment of ring closure	tropic Rock Strength on the Stability of Large Slopes using Limit 11:30 a.m. Equilibrium Analysis Ryan Alexander ZIEBARTH, Andrew G. CORKUM, Ian R. STILWELL,	12:00 p.m. Discussion	vo-Oxfordian claystone under X-ray tomography Mensan Dèlwindé Gildas Cedric AGBOLI, Dragan GRGIC, Albert GIRAUD	Rockfall simulation and identification their sources locations along Massive external crystalline in Alps zone using LiDAR and Pangrama Images: Case of La Grave, France
Vaibhav SHRINGI, Manuel Bernhard WINKLER, Alexander KLUCK- NER, Thomas MARCHER	Derek KINAKIN Geotechnical and geophysical investigation of a rock mass for the	Development and functional verification of an ultra-deep drilling core geological environment true triaxial apparatus Xiwei ZHANG, Lei SHI	Consideration to evaluate maintenance process for utilization of non-supported underground quarries	Panorama Images: Case of La Grave, France Tiggi CHOANJI, Li FEI, Charlotte WOLFF, Franck BOURRIER, Romain GAUCHER, Kan Jean KOUAMÉ, Marc-Henri DERRON, Michel JA-
Estimation of fracture diameter probability distribution based on truncated trace-length data	design check of an ornamental stone quarry 11:45 a.m. Maria Teresa CARRIERO, Cesare COMINA, Anna Maria FERRERO,	Hydromechanical characterization of Château-Landon chalk be-	Rui HUANG, Takafumi SEIKI, Qinxi DONG, Shizuo NOGUCHI, Takeshi OHMURA	BOYEDOFF Monitoring the rock-mechanical safety of underground limestone
Jian LIU, Long YU, Xingguang ZHAO, Liang CHEN, Ju WANG Kinematic simulation of rock cutting performance of a 130t Road-	Maria Rita MIGLIAZZA, Battista TABONI, Gessica UMILI, Federico VAGNON, Sergio Carmelo VINCIGUERRA	Danielle PAJIEP, Jian-Fu SHAO, Nathalie CONIL, Mountaka SOULEY, Philippe GOMBERT	Design of underground structures and support systems for extraction of inclined coal seam Arka Jyoti DAS, Prabhat Kumar MANDAL, Ranjan KUMAR	quarries using fibre optic sensing technology Edo NOORDERMEER, Roland BEKENDAM, Karlijn BEERS, Auke NACHENIUS, Devrez KARABACAK
header in Korea Mun-Gyu KIM, Hyun-Jun PARK, Joo-Young OH, Chang-Heon SONG, Jung-Woo CHO, Ho-Young JEONG	A reliability-based design approach for geotechnical domain mod- elling in pit slope design Amoussou ADOKO, Hayes ANYASODOR	Shear strength determination of very rough and partially filled extension fractures in thick-bedded and karstified limestones	LUNCH BREAK	A new in-situ monitoring system to determine stability of underground coal pillar subjected to dynamic loading: electrical resis-
LUNCH BREAK	Rock Mechanics Characterization of Columnar Sandstone of Cerro Koi (Paraguay) and Some Slope Stability Issues of the Associated	Petar HRŽENJAK, Ivana DOBRILOVIĆ, Dražen NAVRATIL, Biljana KOVAČEVIĆ ZELIĆ	GEOLOGICAL RISKS AND NATURAL HAZARDS (T07) Chair: Christian ZANGERL, Haris SAROGLOU	tance measurement system (ERMS) ihsan ÖZKAN, Mehmet MESUTOĞLU, Mahmut Yasin ÇETINKAYA
NUMERICAL METHODS IN ROCK ENGINEERING (T13) Chair: Helmut F. SCHWEIGER, Daniela BOLDINI	Open Pits Ömer AYDAN, Reşat ULUSAY, Jose PAVON, Nazli Tunar OZCAN	Study of stress-dependent dynamic properties of jointed rock using resonant column apparatus Sakshi ROHILLA, Resmi SEBASTIAN	Room: Trakl Hall (3rd upper floor) Instability phenomena affecting the cultural heritage cave of Antro	Low-frequency acoustic emission characteristics from meter-scale fracturing of rock-like brittle materials
Room: Papageno Hall (ground floor) The correlation between aperture evolution and induced seismicity	A critical look to the practical use of Rock Mass Rating (RMR) and Slope Mass Rating (SMR) Miguel CANO, José Luis PASTOR, Roberto TOMÁS, Adrián	Shear failure and fracturing of horizontally layered shale Marte GUTIERREZ. Daisuke KATSUKI. Runar NYGRAARD	della Sibilla (Cuma, Italy) 02:15 p.m. Daniele SPIZZICHINO, Paolo Maria GUARINO, Gabriele LEONI, Mena	June Ho PARK, Jin Seop KIM, Chang Ho HONG, Ji Won KIM, Tae Hyuk KWON
02:15 p.m. during simulated hydraulic fracturing in lab-scale coal samples Xin ZHANG, Guangyao SI, Joung OH	병후 RIQUELME, Luis JORDÁ, José SERÓN 또 로	A Mathematical Model for Shear Stiffness and Dilation for Saw- Tooth Joints under CNL Conditions	DILETTO, Edoardo LUSINI, Fabio PAGANO, Marida SALVATORI, Dan- iela BOLDINI	Monitoring long-term hydromechanical processes in swellable Opalinus Clay shale of the new Belchen tunnel (Switzerland) Martin ZIEGLER, Simon LOEW, Arash Alimardani LAVASAN, Ernan-
02:30 p.m. Discussion A 3D breakable Grain-Based Discrete Element model for trans-	Site specific joint spacing distribution of roadcut slopes in a selected stretch of national highway in Indian Garhwal Himalayas Lal HRUAIKIMA, Mahendra SINGH, Sarada Prasad PRADHAN, Jas-	Sujeet BHARTI, Rakesh KUMAR, Debasis DEB, K. U. M. RAO Practical estimation of veinlets shear strength properties in hypo-	Practure characteristics obtained from core observations and image 02:30 p.m. logs in a borehole drilled through an active fault zone Susumu SHIBUTANI, Weiren LIN, Koichiro SADO	do SARAIVA
02:45 p.m. versely isotropic rocks Leandro Lima RASMUSSEN, Ki-Bok MIN	preet SINGH Assessment of structurally-controlled slope failure in a steeply	gene rock mass Esteban HORMAZABAL, Andrea RUSSO	Characteristics of reinforcement for earthquake resistance in mountain tunnel	LUNCH BREAK DIGITALIZATION & AUTOMATISATION (TO5)
Novel numerical approach to modeling excavation in hard rocks 03:00 p.m. Erick RÓGENES, Leandro RASMUSSEN, Márcio FARIAS, Alessandra	dipping Iron ore min Suryajyoti NANDA, Satyam CHOUDHURY, Shantanu PATEL	ROCK BOWL + LUNCH BREAK	02:45 p.m. Kosuke KAWATA, Minaho FUKUSHIMA, Akira MATSUOKA, Atsushi KUSAKA, Nobuharu ISAGO	Chair: Thomas MARCHER, Helmut WANNENMACHER Room: Doppler Hall (4th upper floor)
Development of a 3D discrete element method approach to study	Rock slope design and residual risk management for Aktogay Cop- per Mine, Kazakhstan Nurkhair TELEU, Neil BAR, Herman ZLOBIN, Philipp MOHR	02:00 p.m Sponsors contribution Epiroc by Erik Svedlund GEOLOGICAL INVESTIGATION AND CHARACTERIZATION (T06)	Impact of climate change on the collapse of shallow mines – feed- 03:00 p.m. back from France	Project management in connection with a digital construction site 02:15 p.m. with BIM in tunneling
the evolution of rock cutting mechanism in high-depth conditions: application to Vosges Sandstone Nicolas GONZE. Fanny DESCAMPS. Jean-Pierre TSHJBANGU	LUNCH BREAK	Chair: Scott KIEFFER, Michael F. GEORGE Room: Europa Hall (2nd upper floor)	Nathalie CONIL, Clara MAGHAMI, Marwan ALHEIB, Philippe GOMBERT Seismic resistance evaluation based on earthquake damage survey	David HACKER, Martin ZEINDL Utilizing sensor technology in drilling optimization
A new perspective of load-transfer behavior of rough rock-socketed piles 03:30 p.m. José G. GUTIÉRREZ-CH, Salvador SENENT, Svetlana MELENTIJEVIĆ,	ROCK AND ROCK MASS PROPERTIES (T15) Chair: Andreas GORICKI, Thomas FRÜHWIRT	Block in Point Cloud Data (BLOCKinPCD): A digital characterization 02:15 p.m. system for rock outcrops	03:15 p.m. data of mountain tunnels Katsumi KAMEMURA	02:30 p.m. Jukka-Pekka UUSITALO, Tobias WENDEL-EICHHOLZ, Matleena MELASAARI
Rafael JIMENEZ A continuum-oriented finite-discrete element method (cFDEM) for	Room: Mozart Hall (ground floor)	Scott KIEFFER, Qian LIU Roughness measure of a large in situ discontinuity surface by	The assessment of dynamic stability of rock slopes with hexagonal jointing through shaking table tests and dynamic limiting equilibrium method (DLEM)	The creative process for the development of an autonomous bolt- 02:45 p.m. ing arm for underground mines Ana Raquel Sena LEITE, Hatem MRAD
rock fracturing simulation Ke GAO, Weibing CAI, Shugang AI	O2:15 p.m. The Tauernmoos pressure tunnel: a multidisciplinary approach to verify and ensure design rock mass conditions during construction Andreas MAYER, Franz REITER, Andreas FREUDENTHALER, Miro-	02:30 p.m. non-contact survey Maria Teresa CARRIERO, Anna Maria FERRERO, Maria Rita MIGLIAZ- ZA. Battista TABONI. Gessica UMILI	Ömer AYDAN, Yuki MURAYAMA, Takashi ITO, Naohiko TOKASHIKI Evaluation of natural foliation effect on deformation characteristic	Rock evaluation of NATM tunnel face using deep learning 03:00 p.m. Masanari NAKATA, Karnallisa Desmy HALIM, Yeboon YUN, Ha-
The shear behavior of the rock-concrete interface with different angles: A DEM simulation	slav MARENCE Hard soil and rock classification – Pressuremeter data versus	A study on point cloud interpretation of fracture intensity and its 02:45 p.m. spatial variability	and shear strength parameters of Chamoli (Uttarakhand) rock using a Triaxial system Dinesh JAGANIYA, Manish SHAH, Usha PATEL	rushige KUSUMI, Akinobu NISHIO Development and implementation of a sensor-supported rock
Yingcai HOU, Lushan SHU, Kai SHEN, Yadong XUE Development of an efficient parallelization scheme for fully implicit	02:30 p.m. tests on samples Peter ALLAN, Jean-Pierre BAUD, Robert HEINTZ	Yong-Zhi HUANG, Tai-Tien WANG, Fu-Shu JENG	Geomechanical and hydrogeological characterization of fracture systems in Banyoles Karst caprock units, Catalunya	03:15 p.m. bolt system for underground monitoring Wolfgang DOLSAK, Mislav MIKULEC
discontinuous deformation analysis (dda) Tatsuki TOKUDA, Ryota HASHIMOTO	Fundamental study on estimation of permeability at in-situ EDZ from pore air pressure response Masahiko OSADA, Koji OSAWA, Christina Putri WIDYANINGTYAS,	03:00 p.m. Chao ZHANG, Wei WU Virtual reality based uncertainty assessment of rock mass charac-	Aline CONCHA-DIMAS, Ivan FABREGAT GONZALEZ Failure mechanism of the utility tunnel with flexible joints under re-	Comparison between manual and automated determination of discontinuity orientations in different rock mass types
Shear wave propagation across jointed rocks of varying seismic impedance Kallol SAHA, Resmi SEBASTIAN	Yota TOGASHI Intact Strength Determination of Rock Containing Mesodefects	03:15 p.m. terization of tunnel faces Erlend SKRETTING, Georg H. ERHARTER, Jessica Ka Yi CHIU	verse fault dislocation Lianjin TAO, Zhigang WANG, Zhibo JIA	Julia L. GUDLEWSKA, Marc S. OGAN, Julia GALLAS, Saran SCHUMS- KI, Mandy DUDA, Tobias BACKERS
Numerical Calibration of Laboratory Results of 3D Printed Sandstone Analogues using Finite/Discrete Element Method (FDEM)	03:00 p.m. using the Leeb Hardness Test Andrew Garnet CORKUM, Derek KINAKIN, Diego MAS IVARS	Holographic mixed reality: an enhanced technology for visualizing 03:30 p.m. and evaluating complex 3D geologic data	Development of post-mining multi-hazard assessment methodology Hippolyte DJIZANNE, Marwan AL HEIB, Aurélien GOUZY, Christian	Influence of SfM reconstruction techniques on the extraction of rock slope discontinuities Adrián J. RIQUELME, José Luis PASTOR, Miguel CANO, Roberto
Dima SHAMSEDINE, Pooya HAMDI, Florian AMANN Effect of joint dip on the transmission of stress waves from a mov-	Effect of cyclic thermal loading on a carbonate rock: implications 03:15 p.m. for thermal energy storage (Atharina Meta NELIMANNI Mandy PUDA Tobias PACKERS	Markus KASPAR, D. Scott KIEFFER, Qian LIU Structural mechanisms contributing to large-scale hangingwall in- stabilities on the LIG2 reef horizon	FRANCK Review and evaluation of Porosity Rate Model (PRM) for highly frost	TOMÁS, Antonio ABELLÁN Identification of the optimal time series machine learning algo-
ing point load in a parallel jointed rock mass Harry HOLMES, Chrysothemis PARASKEVOPOULOU, Mark HILDY- ARD, Krishna NEAUPANE, David CONNOLLY	Assessment of the creep behavior of siltstone for the Snowy 2.0	stabilities on the UG2 reef horizon Aletta Gertruida HARTZENBERG, Daniel Francois MALAN A 2023 perspective on Pock Mass Classification Systems	Susceptible soils Zheng GONG, Jang-guen LEE, Gyu-Hyun GO	rithm for the prediction of the ground subsidence with TBM ma- chine data
ARD, Krishna NEAUPANE, David CONNOLLY Applicability of DEM - Rate Process Theory approach for rock creep simulation	hydropower station using multistage uniaxial and triaxial creep tests Samer ABOU KHEIR, Andrea BROGIATO, Patrick LIGNIER, Angelo	A 2023 perspective on Rock Mass Classification Systems Georg H. ERHARTER, Tom F. HANSEN, Shengwen QI, Neil BAR, Thomas MARCHER	Numerical Modelling Study of the 2016 Gyeongju Earthquake Rup- ture Process and Correlation with Groundwater Level Change Jeoung Seok YOON, Anne STRADER, Jian ZHOU, Soo-Gin KIM, Jae-	Myung-Kyu SONG, Hyun-Koo LEE, Jae-Kyum LEE, Sean Seungwon LEE Deen learning-aided prediction of peak shear strength of rock
simulation José G. GUTIÉRREZ-CH, Salvador SENENT, Eliana GRATEROL, Peng ZENG, Rafael JIMENEZ	LAMBRUGHI, Gabriele DE CARLI, Mark DIEDERICHS, Ivan CHING, Damiano FRONTINI	Key Parameters and Distribution in Rock Mechanics for HLW Site Selection in Korea	Yeol CHEONG An improved calibration and uncertainty analysis for a ground sub-	Deep learning-aided prediction of peak shear strength of rock fractures Jinfan CHEN, Zhihong ZHAO, Xingguang ZHAO
COFFEE BREAK	A practical approach to determining the basic friction angle of nat- ural and rough discontinuities in carbonate rock slopes Zhen YE, Qian LIU, Qiang XU, Xiujun DONG, Feng PU	Dae-Sung CHEON, Seungbeom CHOI, Won-Kyong SONG Rock mass characterization during the construction of a twin-tube	sidence using physics-informed neural network (PINN) approach Hyung-Mok KIM, Yashwanth Kumar GUJJALA, Junya INOUE, Dong-	Deep Learning based Automatic Fracture Identification in CT Images of Rock
NUMERICAL METHODS IN ROCK ENGINEERING (T13) Chair: Helmut F. SCHWEIGER, Daniela BOLDINI Page Dangen Hall (ground floor)	Zhen YE, Qian LIU, Qiang XU, Xiujun DONG, Feng PU Evaluation of different methods for determining rock masses stiffness	motorway tunnel in Hungary Gabor SOMODI, János BORSODY, Ágnes KRUPA, Krisztián PETRIK, Balázs VÁSÁRHELYI	Woo RYU COFFEE BREAK	Chuyen Ngoc PHAM, Li ZHUANG, Sun YEOM, Hyu-Soung SHIN Global Unstructured Digital Image Correlation for determining
Room: Papageno Hall (ground floor) Numerical Modelling-Based Methodology for Generating Fragility	Neil BAR, Wulf SCHUBERT Estimation of cutting force considering intermediate dynamic rock	Applications of the Structure from Motion photogrammetric technique to solve geotechnical problems at different scales	GEOLOGICAL RISKS AND NATURAL HAZARDS (T07) Chair: Christian ZANGERL, Haris SAROGLOU	strains around circular opening Tushar BHANDARI, Debasis DEB, Chamanth Sai Reddy VEMU-LAPATI
04:30 p.m. Curves of Underground Tunnels under Static Loading Shahriyar HEIDARZADEH, Ali SAEIDI	strength using multiple linear regression Yudhidya WICAKSANA, Suseno KRAMADIBRATA, Seokwon JEON	Ramiro GARCÍA-LUNA, Salvador SENENT, Rafael JIMENEZ Application of the point counting technique for estimating the VBP	Room: Trakl Hall (3rd upper floor)	Intelligent risk management for TBM hard rock tunnelling based on Knowledge
04:45 p.m. The effective material properties of rock mass inversed from dynamic test data Rui HUANG, Takafumi SEIKI, Qinxi DONG, Hui WANG, Ömer AYDAN	Classification of weak, carbonate fault rocks Vasileios KALLIMOGIANNIS, Charalampos SAROGLOU	of geotechnically complex formations (bimrocks/bimsoils) Maria Lia NAPOLI, Lorenzo MILAN, Monica BARBERO, Edmund	Development of a double-corrosion-protected self-drilling micro- pile for the foundation of rockfall protection structures Matthias J. REBHAN, Hans-Peter DAXER, Markus SCHUCH, Franz	Graph Haojun PANG, Fei JIA, Yingcai HOU, Feipeng HUANG, Yadong XUE
Influence of contact shape and distribution on fluid flow through a	Effect of scale and in-situ stress ratio on the deformation modulus of rock mass around tunnels	MEDLEY COFFEE BREAK	TSCHUCHNIGG, Roman MARTE An approach to assess the detachment propensity of rockfall source	Towards the development of a harmonized inventory database for decision support: automatized information extraction
05:00 p.m. Masoud TORKAN, Amir HOSSEINI KHORASGANI, Lauri UOTINEN, Alireza BAGHBANAN, Mikael RINNE	Sai Srujan Kumar CHALAVADI, Mahendra SINGH, Yogendra SINGH, Jaysing CHOUDHARI	GEOLOGICAL INVESTIGATION AND CHARACTERIZATION (T06) Chair: Scott KIEFFER, Michael F. GEORGE	04:45 p.m. areas: the Susceptibility Index to Failure (SIF) Maria Lia NAPOLI, Monica BARBERO, Marta CASTELLI, Francesco CASTELLI	Alla SAPRONOVA, Paul Johannes UNTERLASS, Vaibhav SHRINGI, Thomas MARCHER Comparison of an underground rock face 3D modeling perfor-
Assessment on the in-situ rock stress condition along an unlined pressure tunnel/shaft of a Norwegian Hydropower Project using numerical modeling	New testing equipment to study dynamic fracture of rock and cement-based materials subjected to the action of roadheaders Diego-José GUERRERO-MIGUEL, Martina-Inmaculada ÁLVA-	Room: Europa Hall (2nd upper floor)	05:00 p.m. Predicting geomechanical hazard: utopia or reality? Adeline DELONCA	Comparison of an underground rock face 3D modeling perfor- mance: SfM-MVS with optimum photographing settings and Li- DAR technology
Bikash CHAUDHARY, Krishna Kanta PANTHI, Nghia Quoc TRINH	REZ-FERNÁNDEZ, María-Belén PRENDES-GERO, Celestino GONZÁLEZ-NICIEZA, Covadonga BETEGÓN-BIEMPICA, Emilio	Performance of the empirical method with rock mass classification systems to derive optimal rock support design in poor rock mass conditions	Rockfall instability on high granitic domes: Stawamus Chief, B.C.,	Junsu LEEM, Jineon KIM, Jiwon CHOI, Jae-Joon SONG COFFEE BREAK
Effect of blast damage on pillars of caving mines 05:30 p.m. Edgar MONTIEL, Max BLODEL, Edjan BUSTAMANTE, Esteban HOR- MAZABAL	MARTÍNEZ-PAÑEDA COFFEE BREAK	Jorge TERRON-ALMENARA, Charlie C. LI Rapid seismic data acquisition in a TBM road tunnel excavation with	05:15 p.m. Benjamin COUGHLAN, Christian SAMPALEANU, Glyn WIL-LIAMS-JONES, Doug STEAD	DIGITALIZATION & AUTOMATISATION (T05)
Optimum spacing of TBM disc cutters using an explicit finite 05:45 p.m. element approach	ROCK AND ROCK MASS PROPERTIES (T15)	04:45 p.m. segmental lining Thomas DICKMANN, Jozsef HECHT-MÉNDEZ, Dirk KRUEGER, Chris-	The collapse of Torrione Sucai (Mt. Viso, Italy): rockfall analysis and data calibration	Chair: Thomas MARCHER, Helmut WANNENMACHER Room: Doppler Hall (4th upper floor)
Asif Jeelani BHAT, Dr vidya Bhushan MAJI Data Assimilation for Prediction of Surrounding Rock Mass Behav-	Chair: Andreas GORICKI, Thomas FRÜHWIRT Room: Mozart Hall (ground floor)	toph SINKOVEC, Christian SCHÖNLECHNER Acoustic Emission Characteristics of Mode I Rock Fracturing Acthur D. DE ALMIS Model SERATI Darak MARTIN Arcady DVSKIN	Giulia TORSELLO, Marta CASTELLI, Michele MORELLI Assessment of face area hangingwall stability in a hard rock bord	Concept for Tunnel Information Modelling based work-preview and documentation during construction at Tunnel O4:30 p.m. Apgath Hans FYENREPGED lines MASSIMO-KAISED Hannah
06:00 p.m. ior during Underground Structure Construction Phases Yasuhisa AONO, Tetsuo OKUNO	Swelling pressures of clay rocks from laboratory tests: experience and improvements Walter STEINER, Fritz MADSEN, Jean-François MATHIER	05:00 p.m. Arthur D. DE ALWIS, Mehdi SERATI, Derek MARTIN, Arcady DYSKIN, Elena PASTERNAK, David J. WILLIAMS Hydrogology and grouting - a field experiment in shallow crys-	and pillar mine Jeane Mokgadi MATSOBANE, Bryan Philip WATSON	Angath Hans Exemberger, ines Massimu-Raiser, Hannan SALZGEBER, Peter KOMPOLSCHEK, Frédéric Heil, Matthias FLORA
	The influence of microwave treatment on the Cerchar abrasivity 04:45 p.m. of igneous rocks	Hydrogeology and grouting - a field experiment in shallow, crys- 05:15 p.m. talline rock Åsa FRANSSON	Failure mechanism and slip characteristics of landslides on loess plateau by continuous-discontinuous method: A case study Haojie YANG, Gan QI, Jili FENG, Zhengyuan LIU, Dejian LI	Application of hybrid machine learning based quality control in daily site management Alexander ZÖHRER, Vincent WINTER, Anika TERBUCH, Paul
	Sair KAHRAMAN, Egemen SAYGIN, Mustafa FENER Experimental and numerical study on the creep behavior of a rock	05:30 p.m. Physics-informed machine learning of flow and transport problems Hongkyu YOON, Jennifer HARDING	Rockfall hazards – Risk assessment, benefit/cost analysis and the design of flexible rockfall protection systems	O'LEARY, Negin KHALILI-MOTLAGH-KASMAEI Automatic Fracture Extraction in Laboratory Rock Sample using
	05:00 p.m. mass with filled joints Maximiliano R. VERGARA, Ana LIBREROS, Karl BALTHASAR	Structural and Geotechnical Investigations for the Remediation of 05:45 p.m. Jetties and Seawalls on Heligoland	Christian BINDER, Anna FREUIS, Michael SCHREINER, Mathias SMESNIK	05:00 p.m. Deep Learning method Jian LIU, Aohui OUYANG, Omar ALDAJANI, Zili LI, Herbert EINSTEIN
	Spatial modeling of rock strength heterogeneity and anisotropy using Universal Discontinuity index (UDi)	Holger JUD, Dieter TRONICH, Gerd SIEBENBORN Mitigating the rock fall and rockburst risk in South African gold and	Study of the influence of anthropogenic galleries on the chalk cliff stability at Normandy region (France)	Integration of Point Cloud Data for Numerical Simulations Using NURBS Surfaces O5:15 p.m. Odd Point Cloud Data for Numerical Simulations Using NURBS Surfaces Andreas-Nizar GRANITZER Franz TSCHI ICHNIGG Wolfgang SI IM-
	Amin Hermai Nejad, Eduardo Rojas, Aivaro Pena, Benoit Cre- SPIN	platinum mines through advanced knowledge of the ore body Michelle PIENAAR, Raymond DURRHEIM, Musa MANZI, Glen NWAILA, Hennie GROBLER, Thabang KGARUME, Dean PRETORIUS,	Machine Hosni, Claire MyR, Bastien COLAS, Isabelle HALFON, Yannick THIERY, Karim BEN SLIMANE	Andreas-Nizar GRANITZER, Franz TSCHUCHNIGG, Wolfgang SUM- MERER MWD data analysis for optimization of tunnel excavatio
	A theoretical framework for calibrating the transversely isotropic elastic rock parameters from UCS tests on cylindrical specimens using circumferential strain measurements	Michael VAN SCHOOR, Abrie OBERHOLSTER	URUCUM Mine: Rockfall protection and monitoring system Felipe GOBBI, Bruno DENARDIN DA ROSA, Dione Henrique DIAS, Fabio BERTUOL, Nataly AYUMI TOMA, Adoniran COELHO	05:30 p.m. Alla SAPRONOVA, Kazuo SAKAI, Shuntaro MIYANAGA, Paul Johannes UNTERLASS, Abdallah Ahmed Fouad Elsayed SOLIMAN,
	Manuel WINKLER, Thomas FRÜHWIRT, Thomas MARCHER Estimation models for deformability of marlstones based on their	Understanding the geological and geotechnical drill core logging process – key to success Johannes HORNER, Jennifer Andrea BETANCOURT	Rock Fall Risk – Modular Risk Management Process Rainer KIENREICH, Alexander KLUCKNER, Thomas MARCHER	Thomas MARCHER Generation of a Discrete Fracture Network from digital disconti-
	physical and mechanical properties and for variable load range Srđan KOSTIĆ	Pavement failure and flooding of tunnel in limestone geology Hong-Gyu LEE	Experimental simulation of mass flow characteristics for evaluation of the role of flow-bed roughness	05:45 p.m. nuity data captured using the 3D Axis Mapping method Josephine MORGENROTH, Jim HAZZARD, Shelby YEE, Davide ELMO
	Predicting strength loss of igneous rocks treated with microwave energy Sair KAHRAMAN, Ahmet Niyazi CANPOLAT, Mustafa FENER	Diagnosis of bench stability conditions in an iron ore open pit in the Quadrilatero Ferrifero/Minas Gerais/Brazil	Abhijeet SINGH, Deepanshu SHIROLE Slope stability and engineering characteristics of rock mass at the	An example of calibrating physical parameters in a constitutive model based on machine learning framework
	Porosity of source rocks eligible for interaction with gases and liquid	Camila Broetto MILLI, Alberto Ferreira AMARAL, Ana Paula DAHER, Marcos NASCIMENTO, Silas Santos SALGADO, Daniel Chaves dos SANTOS	boundary of slate and schist: Study of Southern Cross-Island Highway in southeastern Taiwan Pai-Chiao LO, Wei LO, Yong-Zhi HUANG, Ya-Chu CHIU, Tai-Tien	Yupeng CAO, Weiren LIN, Feng ZHANG A machine learning model to estimate in-situ rock strength from
	nquia Daniela ŘIMNÁČOVÁ, Dominik VÖRÖŠ, Vendula NATHEROVÁ, Rich- ard PŘIKRYL, Tomáš LOKAJÍČEK	Monitoring damage evolution in a tectonically faulted clay shale — an experiment of the Mont Terri URL	Pai-Chiao LO, Wei LO, Yong-Zhi HUANG, Ya-Chu CHIU, Tai-Tien WANG, Yu-Chung HSIEH	borehole geophysical logs Zizhuo XIANG, Zexin YU, Joung OH, Guangyao SI, Ismet CANBULAT
	Influence of shape surface on the actual stress distribution generated along the contact during the uniaxial compressive strength	Martin ZIEGLER, Markus FURCHE, Thies BEILECKE, Thomas BUR- SCHIL, Anne OBERMANN, Qinghua LEI, Chenxi ZHAO, Simon LOEW		Comparative Analysis of CAI Estimation using Symbolic Regression and Machine Learning Approaches
	test María RAMÍREZ-BERASATEGUI, Diego-José GUERRERO-MIGUEL,	Assessing Intact Rock Properties for the Salang Highway Tunnel Upgrade Route Selection Study		Tae Young KO, Ju-Pyo HONG Virtual learning environments for rock engineering education and

María RAMÍREZ-BERASATEGUI, Diego-José GUERRERO-MIGUEL, Ramón GUTIÉRREZ-MOIZANT, María-Belén PRENDES-GERO, Martina-Inmaculada ÁLVAREZ-FERNÁNDEZ

Geomechanical characterization of two granites to establish an experimentally based benchmark for numerical simulation – a

laboratory study Lucas Conrad WITTE, Mandy DUDA, Murat AYDIN, Hossein ASGHARI CHEHREH, Tobias BACKERS

Correlating uniaxial compression strength and static Young's mod-ulus with Schmidt hardness for prasinites Dimitrios KOTSANIS, Pavlos NOMIKOS

Comparison of conventional and cyclic oedometer swelling tests

on rock specimens Maximiliano R. VERGARA Virtual learning environments for rock engineering education and training - a guideline for development, examples, and lessons

Mateusz JANISZEWSKI, Lauri UOTINEN, Masoud TORKAN, Mikael

Study on comparing current software for parametric modelling in Tunnel Information Modelling
Hannah SALZGEBER, Larissa SCHNEIDERBAUER, Kathrin GLAB,

From prognosis Ground Model to Tender Model and Tunnel Construction Framework Plan with Tunnel Information Modelling Ines MASSIMO-KAISER, Hans EXENBERGER, Hannah SALZGEBER,

Feature Sampling and Balancing for Detecting Rock Bolts from the LiDAR Point Clouds Sarp SAYDAM, Chengpei XU, Binghao LI, Birgul TOPAL, Serkan SAY-

Digitalization and creep modelling for trinocular-cavern based

Using webcam to visually observe the mechanical behaviors of Shirahama sandstone under triaxial compression
Daisuke ASAHINA, Takato TAKEMURA, Takahisa ENDO, Yu

Amanda HUANG, Frank LI, Tong Joo SIA, Qianbing ZHANG

metro statio

FRIDAY, OCTOBER 13

PAPAGENO HALL NEW DEVELOPMENTS IN ROCK SUPPORT (T12) Chair: Robert GALLER, Karl BÖHM Research of safety-relevant natural and structural factors influencing the load-bearing capacity of rock stabilization with chem-08:30 a.m. ical grouts Conrad BOLEY, Paul PRATTER, Lisa WILFING Verification of design relevant parameters for new pipe umbrella 08:45 a.m. support systems Rational design for tunnel ground support with membranes based on the geomechanically classification of Q by 09:00 a.m. Barton Roberto LUIS, Rico BRÄNDLE, Gabriel VON RICKENBACH German FISCHER, Sergio MARK Prevention of catastrophic corrosion failure of rockbolt and cable bolt in underground coal mines Honghao CHEN, Hamed Lamei RAMAND, Imrana KABIR, Onder KIMYON, Ren CHEN, Naresh KUMAR, Cindy GUNAWAN, Peter CRAIG, Ismet CANBULAT, Micheal MANEFIELD, Serkan SAYDAM Full-Scale Pullout Tests of Rock Anchors in Limestone Testing the

Interfacial Bond Strengths 09:30 a.m. Bjarte GRINDHEIM, Charlie Chunlin LI, Are Håvard HØIEN Experimental Investigations of Instrumented Fully Grouted Rock 09:45 a.m. Bolts under Pull Load Jemishkumar Vijaykumar MODI, Debasis DEB, Rakesh KUMAR

10:00 a.m. reinforcing rocky slopes containing weak interlayers Fei ZHAO, Zhenming SHI, Songbo YU

Research on application of new combined support structures in

New yielding elements made of high-strength expanded polysty-

NEW DEVELOPMENTS IN ROCK SUPPORT (T12) hair: Robert GALLER, Karl BÖHM

	Manuel ENTFELLNER, Helmut WANNENMACHER
11:00 a.m.	Reinforcement effect of deformation-controlled tunnelling sup- ports based on three-dimensional tunnel excavation analysis Yasuhiro YOKOTA, Kensuke DATE, Atsushi SAINOKI, Masako ISHII, Kazuhiko MASUMOTO, Mori UTSUNO
11:15 a.m.	Microfibrillated cellulose as additive for wet-mix shotcrete Mathias LAURAEUS, Mikael RINNE, Antti LAUKKANEN
11:30 a.m.	On The Expected Location of Fire-Induced Concrete Spalling Dorna EMAMI, Souvik SAHA, Mehdi SERATI, Harry ASCHE, David J

Influence of rock crystal structure on bond strength at the rock-shotcrete interface Kunze LI, Hamed LAMEI RAMANDI, Chengguo ZHANG, Sahand TAD-

Blast Induced Vibrations and Strain Rate Effects in Dynamic Capaci ity of Underground Concrete Structures Frederick KUHNOW

12:15 p.m. Discussion

12:00 p.m.

GEOLOGICAL RISKS AND NATURAL HAZARDS (T07) Chair: Christian ZANGERL, Haris SAROGLOU Room: Papageno Hall (ground floor)

BIRI, Serkan SAYDAM, Joung OH

System of highway slope disaster information collection, integration, simulation and judgement Chia-Chi CHIU, Wen-Jie SHIU, Ching-Fang LEE, Meng-Chia WENG,

> Effect of shape on the survival probability of rock replicas during free fall tests

Olivier BUZZI, Davide GUCCIONE

Numerical analysis of rockfall fragmentation mechanism

Jian HUANG, Jingqing YUAN, Jianhong LIAO Closing the gap from spatio-temporal displacement monitoring to geomechanical process understanding of cascading multi-hazards caused by deep-seated gravitational slope deformations 02:30 p.m. Johannes BRANKE, Jan PFEIFFER, Thomas ZIEHER, Magnus

BREMER, Martin RUTZINGER, Bernhard GEMS, Margreth KEILER, Barbara SCHNEIDER-MUNTAU 10 years of thermo-mechanical monitoring of rock columns - les chandelles de l'Escalette, France

02:45 p.m. Muriel GASC-BARBIER, Véronique MERRIEN-SOUKATCHOFF, Jean-Luc GENOIS, Charly MOUGIN, Pierre AZÉMARD Kinematic Analysis and Distinct Element Modelling of a polyphase

03:00 p.m. Reinhard GERSTNER, Christine FEY, Klaus VOIT, Erik KUSCHEL, Gerald VALENTIN, Christian ZANGERL

Discussion

MOZART HALL

Application of Digital Image Correlation for Analysis of Aniso-

08:30 a.m.	Timothy Robert Michael PACKULAK, Émélie GAGNON, Samuel Keith WOODLAND, Jennifer Jane DAY
08:45 a.m.	On the crack initiation location in the Brazilian test: Grif- fith-based insigh Yousef NAVIDTEHRANI, Covadonga BETEGÓN, Robert W. ZIM- MERMAN, Emilio MARTÍNEZ-PAÑEDA
09:00 a.m.	Micro-fracturing in SCB test: Acoustic emission analysis Matej PETRUZALEK, Ali AMINZADEH, Vaclav VAVRYCUK, Zuzana JECHUMTALOVA, Petr KOLAR, Josef ROTT, Tomas LOKAJICEK
09:15 a.m.	Influence of the specimen slenderness on the direct tensile strength of rocks Mauro MUÑIZ-MENÉNDEZ, Ignacio PÉREZ-REY
09:30 a.m.	A new simple shear test of rock prism specimen by torsional shearing

Determining the transversely isotropic elastic constants from strain data by means of different mathematical approaches Manuel A GONZÁLEZ-FERNÁNDEZ, Ignacio PÉREZ-REY, Lean-

Yota TOGASHI, Riho HIRASAWA, Masahiko OSADA

dro R ALEJANO, José MURALHA, Seungki HONG, Ki-Bok MIN Study on the mechanical characteristics of rock-concrete Bra-

zilian disc based on DEM

Yadong XUE, Lushan SHU, Kai SHEN, Yongfa GUO Behaviour of a pre-defined crack propagating under dynamic tensile loading condition

Rabin Kumar SAMAL, Gangavarapu Teresa DES DE MONA,

Size effect and correlation with hardness of the microscopic fracture toughness of the minerals of granite

Determination of an empirical relations between mode I fracture toughness using CB and SCB specimens and Brazilian tensile strength of rocks

Experimental and Numerical Investigations on Bi-axial Loading of Sandstone Brazilian Disks Reza MOTTAGHI, Zhongwei CHEN, David J. WILLIAM, Mehdi

Full-field strain evolution in Brazilian Disc tests using Digital Image Correlation and Adelaide University Indirect Tensile strength test (AUSBIT) Rupesh Kumar VERMA, Giang Dinh NGUYEN, Murat KARAKUS,

Failure response of rocks under different cyclic loading histo-

Abbas TAHERI

11:15 a m	Characterization of Mobilized Cohesion, Friction and Dilation
11:00 a.m.	Cracking evolution for deep hard coal using X-ray in-situ mi- cro-CT technology and fractal theory Liang ZHANG, Xiaopeng LI, Qingxin QI, Haitao LI
10:45 a.m.	ries Abbas TAHERI, Roohollah SHIRANI FARADONBEH

Angles of Brittle Rock During Plastic Deformation 4D imaging of crack evolution and failure mode in 3DP rocklike samples under uniaxial compression by using in-situ mi-

11:30 a.m. cro-ct technology Yulong SHAO, Jineon KIM, Jae-Joon SONG Mechanical properties of 3D printed sandstone analogue with Minoru SATO, Takato TAKEMURA, Daisuke ASAHINA

Influence of microscopic composition on the strength of rocklike materials under various loading rates Meng-Chia WENG, Hoang-Khanh LE, Hung-Hui LI, Chih-Shan LEE, Chia-Chi CHIU

Study on the relationship between uniaxial compressive strength and elastic properties of limestone with various

Numerical Analysis of Thermo-Mechanical Characterization of Indian Sandstone under Dynamic Compressive Loading Abhishek MOHAPATRA, Anjali KUMARI, Sunita MISHRA

Evaluation of the dilatant behavior of a crystalline rock using full-field optical imaging and ultrasonic monitoring Deepanshu SHIROLE, Gabriel WALTON, Ahmadreza HEDAYAT,

Effect of rock stiffness change on acoustic emission The combined effects of water saturation and strain rate on crack initiation and damage stress of rock

Characterization of Poisson's ratio and Elastic Modulus of granitic rocks: from micro-crack initiation to failure . Samad NARIMANI GHOURTLAR, Seyed Morteza DAVAR-

PANAH, László KOVÁCS, Balázs VÁSÁÁRHELYI Understanding the Microscopic Mechanisms of the bi-modu-

Samarjeet KUMAR, Aditi NUWAL, Shantanu Kumar PATEL

Determining the Magnitudes of Maximum and Minimum Horizontal Stresses from Borehole Data: Comparison Between 01:45 p.m. Borehole Failure Approach and Poroelastic Strain Model

Understanding shale fracture network complexity in the lab-02:00 p.m. Aly ABDELAZIZ, Phyllis S. WU, Mei LI, Earl MAGSIPOC, Karl PE-

ter flooding with multiple well patterns under non-isothermal 02:15 p.m. Yuhao LIU, Fengshou ZHANG, Dingwei WENG, Hongbo LIANG, Chunming HE

> Mechanical anisotropy and tension-shear characteristics of shale in Pengshui area, Chongqing Shouding LI, Zhiquan YU, Supeng ZHANG, Jianming HE, Zhaobin

Numerical investigations on THM coupled process during wa-

Well Cement Composition Optimization for Deep Well Appli-Guodong CHENG, Xueyu PANG, Zhengsong QIU, Jiankun QIN, Ning LI

Laboratory hydraulic fracturing experiments on thermally treated tight sandstone samples under step up incremental loading Pankaj RAWAT, Narendra Kumar SAMADHIYA

Carbon dioxide impact on the mechanical properties of a sandstone from San Jorge Gulf Basin (Argentina) DEZ, Sandra ORLANDI, José ALLARD

Prediction of Safe Mud Window Based on Seismic Data in Carbonate Formation Huiwen PANG, Hanqing WANG, Yan JIN

EUROPA HALL

DEEP MINING AND TUNNELLING (TO4) Chair: Wolfgang HOHL, David BECK m: Europa Hall (2nd upper floor)

08:30 a.m.	Addressing rock engineering challenges faced in the development of a novel, deep mining method Tobias LADINIG, Patrick GAMS, Horst WAGNER, Matthias WIM-	08:30 a.m.
08:45 a.m.	MER, Michal GRYNIENKO Unplanned ore dilution control in longhole mining using sill pillars – A case study	08:45 a.m.
00.43 a.m.	Tuo CHEN, Hani S. MITRI	09:00 a.m.
09:00 a.m.	Displacement and energy demand imposed by rapid bulking and tunnel shape change Fedilberto J. GONZALEZ, Peter K. KAISER, Mark S. DIEDERICHS	09:15 a.m.
09:15 a.m.	Analysis of the behaviour of the Barrier Pillars and Gateroads of the deep Longwall Panel of India using the 3D Finite Element Modelling approach	09:30 a.m.
	Rajashekar Yadav AVULA, Sreenivasa Rao ISLAVATH	

In-situ stress measurement using non-destructive and relief

Zulfigar ALI, Murat KARAKUS, Giang D. NGUYEN, Khalid AMROUCH,

Chris CHESTER Source mechanisms of mining-induced seismicity at Kloof Gold Mine, South Africa – moment tensor analysis of ML≥1.5 events Richard MASETHE, Raymond DURRHEIM, Musa MANZ

Numerical modelling and tunneling experience of the Emergency Stop in Trens, Lots Mules 2-3 (Italy) - Brenner Base Tunnel Davide MERLINI, Matteo FALANESCA, Gianluca BELLA, Antonio

SPAZIANI, Antonio VOZA Coupled thermal and unloading-induced permeability of rock Tao LIN, Zhihong ZHAO, Wen MENG, Xingguang ZHAO

Evaluation of rock stresses measured in a long water tunnel at Tatsuya YOKOYAMA, Akira MITO

DEEP MINING AND TUNNELLING (T04) hair: Wolfgang HOHL, David BECK m: Europa Hall (2nd upper floo

09:30 a.m.

	Prediction of long-term deformation and dimensioning of suppor
10:45 a.m.	in squeezing rock under high overburden
	Jörg-Martin HOHBERG

On the short-term response of Opalinus Clay to tunnelling Linard CANTIENI, Alexandros N. NORDAS, Dennis MOROSOLI,

The influence of brittle failure and its impact on face stability in 11:15 a.m. high-stress tunnelling conditions Joel CHIWARA, Ioannis VAZAIOS, Chrysothemis PARASKEVOPOULOU The Brown-Hoek stress-depth relation revisited

Tobias BACKERS, Simon KATTENBECK, Mandy DUDA Comparison of regression and classification Machine Learning 11:45 a.m algorithms for determining excavation damage zones depths

Yousef GOLABCHI, Matthew A. PERRAS 18 years of monitoring pore pressure evolution during and after excavation in the Callovo-Oxfordian claystone: the main insights

Modeling uncertainty of activity duration in probabilistic time estimation of tunneling projects Mohammad MOHAMMADI, Johan SPROSS Stability analysis of surrounding rock mass in underground pow-

Gilles ARMAND, Carlos PLUA, Minh-Ngoc VU

erhouse based on octree and catastrophe theory Yuepeng SUN, Biao LI, Nuwen XIJ. Oi WANG. Rei IIANG

HYDROPOWER PROJECTS AND DAMS (TO8)

275 m high Yusufeli arch dam - Geotechnical modelling during construction Johannes KLEBERGER, Irmina PÖSCHL, Jonas WEIL A possible way forward to predict the peak shear strength of a

natural, unfilled rock joint under concrete dams based on field Francisco RÍOS BAYONA, Fredrik JOHANSSON, Diego MAS IVARS,

The material extraction for the Kühtai Da Steffen BAUER, Sebastian PERZLMAIER

> Evaluation of the effect of rock surface irregularities on energy gradient in unlined dam spillways -Yavar JALILI KASHTIBAN, Ali SAEIDI, Marie-Isabelle FARINAS, Javier

> A Block Theory approach for rock erodibility assessment incorporating 3D high-resolution site characterization data

Deformation behavior analysis of an arch dam during initial impoundment based on clustering and panel data regression Rujiu ZHANG, Wenyu ZHUANG, Jianjun XU, Liang YIN, Haining WEI, HEPP cavern Kühtai, excavation design and construction experi-Rupert STEIGER, Peter WETZLINGER

Challenges associated with the construction of vertical and inclined shafts in the Himalayan Region Tek Bahadur KATUWAL, Krishna Kanta PANTHI, Chhatra Bahadur Behavior of the Rock Foundation of a Concrete Dam Affected by

Alkali-Aggregate Reactivity Marco OUIRION, Dolice DONTSI MAKEN 3D numerical modelling of stability of underground pumped storage hydropower (UPSH) Yuxi LIU, Qianbing ZHANG, Ivan CHING

> Experimental study of joint opening and block protrusion effects on rock mass erosion in unlined spillway Marie-Hélène WISSE, Ali SAEIDI, Marco QUIRION

CLOSING CEREMONY

Austrian Society for Geomechanics Leopold Müller Prize - John Hudson Rock Engineering Award to Dr Christine Detournay - Science Achievement Award to Prof. Jean Sulem

ISRM 2023 Awards - Technological Innovation Award to Shandong University - Young Rock Engineer Award to Dr Wang Qi - Best Performing National Group Award 2021-2023 - Outstanding Commission Award 2019-2023

- Young Rock Engineer Award to Dr Yota Togashi

Presentation of the main forthcoming conferences - 2024 ISRM International Symposium 2027 ISRM Congress

Farewell speech by the Chair of the Organizing committee Farewell to the outgoing Board 04:50 p.m. Inauguration ceremony of the new Board

The Chair of the Organizing committee declares the Congress

TRAKL HALL

GEOLOGICAL INVESTIGATION AND CHARACTERIZATION (T06)

Room: Trakl Hall (3rd upper floor)		
08:30 a.m.	The impact of rock strength on the measurement of shear modulus from cavity expansion testing Yasmin Nicole BYRNE, Robert WHITTLE	
08:45 a.m.	Interpreting variability of uniaxial compressive strength with insights from vein microstructures Emelie GAGNON, Jennifer J. DAY	
09:00 a.m.	Visualization of Fracture Intersections from 3D X-ray Imaging Madelyn SUMNER, Laura PYRAK-NOLTE	
09:15 a.m.	Discussion	
09:30 a.m.	Development of T-DrillPacker measurement system for groundwater inflow rate and pressure in advanced boring Yusuke HIRATSUKA, Sou KUMAMOTO, Hajime YAMAMOTO	
09:45 a.m.	Roman gold exploitation at the archeological site of Las Médu- las (NW-Spain) by means of Ruina Montium: a rock and fluid mechanics perspective	

X. CURRÁS-REFOJOS, Fco. Javier SÁNCHEZ-PALENCIA Multi-scale analysis of a porous carbonate rock under triaxial conditions Catherine DORÉ-OSSIPYAN, Jean SULEM, Michel BORNERT, Alexandre DIMANOV, Patrick AIMEDIEU, Vincent DE GREEF,

Leandro R. ALEJANO, Elena MARTÍN, Ignacio PÉREZ-REY, Brais

Relations between elastic waves speeds and densities

One-dimensional consolidation properties of sedimentary soft rocks from the Boso Peninsula, central Japan using a constant strain-rate loading system

Characteristics of hydro-magnesite of Salda Lake (Türkiye) and their implications on rocks of Jezerro Crater in Mars Using borehole breakout data to constrain the in situ stress

Junxiong YANG, Sebastian D. GOODFELLOW, John P. HARRISON

CHALLENGING ROCK ENGINEERING PROJECTS (T01)

10:45 a.m.	Design and Construction of the Montreal Largest Transit System Verya NASRI
11:00 a.m.	Stability issues associated with the construction of under ground caverns of Super Dordi Hydropower Project, Nepal Sailesh ADHIKARI, Krishna Kanta PANTHI, Chhatra Bahadu BASNET
11:15 a.m.	The Blue Line Jerusalem LRT Underground Section – Publi Transport in a challenging Project environment

Anton KALTENBÖCK, Martin PURUCKER, Bernhard STACHERL Hard Rock Caverns with low overburden in urban environment 11:30 a.m. Manuel BODE, Magdalena SALLINGER, Paolo ZANANDREA, Thomas MARCHER

PU grouting and sealing measures on the Kramer Tunnel 11:45 a.m. nannes JESSEN, Jochen FILLIBECK, Florian ZAHLER, Raphael 7UBFR 12:00 p.m.

ing active faults in complex and dangerous mountainous areas Lianjin TAO, Haixiang ZHANG, Zhibo JIA, Ming SHI, Zhigang A method for investigating dynamic direct shear behavior of Drop Impact (LBDI) System

Hanlim KIM, Gyeongjo MIN, Gyeonggyu KIM, Youngjun KIM, Jusuk YANG, Kyungjae YUN, Sangho CHO The phenomenon of tools' wear in a marble quarry: laboratory tests to evaluate the performance of conditioning as a wear

Study on anti-dislocation measures for railway tunnels cross-

Alfio DI GIOVANNI, Carmine TODARO, Simone SALTARIN, Marilena CARDU

DOPPLER HALL

NUMERICAL METHODS IN ROCK ENGINEERING (T13)

bastián Ariel DONZIS

Applicability of Artificial Neural Networks (ANN) for equilibrium state prediction in tunnel excavation Alec TRISTANI, Lina-María GUAYACÁN-CARRILLO, Jean SULEM, Se-

Semmering Base Tunnel, Alternative Numeric Modelling of Longterm Rock Mass Behavior and Conceptual Support Design Alexander POISEL, Gunter GSCHWANDTNER, Markus SITZWOHL,

CERN (HL-LHC): challenges and tunneling experience for the design of new underground structures at Point 5 Davide MERLINI, Matteo FALANESCA, Filippo GIANELLI, Gianluca BELLA, Roberto SCHÜRCH, Anastasia LOPEZ- HERNANDEZ

Influence of deep coal mines on the stability of shallow cavities Temenuga GEORGIEVA, Fanny DESCAMPS. George AIDANLIISKY.

09:15 a.m. a Narrow-Vein Type Orebody Using Numerical Modeling

Sara VANDYCKE, Nicolas GONZE, Jean-Pierre TSHIBANGU Comparison of analytical and numerical solutions for stresses and displacements around unlined tunnels with arbitrary cross sections inside anisotropic rock masses

Manuel Bernhard WINKLER, Ali YAZ, Thomas MARCHER Numerical modelling of pillars with weak alteration layers

Production Sequence Analysis of an Overhand Cut-And-Fill Mine in

using the TEXAN code Paul Michael COUTO, Daniel Francois MALAN

Slope support analysis at Jwaneng Mine Christian CANCINO, Loren LORIG, Augusto LUCARELLI, Kabo GAB-ANAKGOSI Otsile BARFI

Finite element analysis-aided performance examination of the umbrella arch method for tunneling through weak zone Hsin Chen CHOU, Cheng Han LIN, On Lei Annie KWOK, Yu Chao LIN, Ming Lang LIN

An iterative scheme for the determination of the conformal mapping coefficients used in closed-form solutions for tunnels with arbitrary geometry Manuel Bernhard WINKLER, Thomas MARCHER, Ali YAZ

Simulation of ground deformation of subway station using pile-beam-arch method Hui HE, Chao WANG, Hua JIANG, Zhengyuan LIU, Zhiyong YANG,

Yusheng JIANG, Jili FENG Numerical evaluation of surface settlement induced by

shield tunneling at rock mass Jun-Beom AN, Jeonguk BANG, Joo-Hyun SEONG, Gye-Chun CHO COFFEE BREAK

NUMERICAL METHODS IN ROCK ENGINEERING (T13) Chair: Helmut F. SCHWEIGER, Daniela BOLDINI

Numerical modeling of cracking process in partially saturated porous media and application to rainfall-induced slope instability 10:45 a.m. analysis

Meng WANG, Zhan YU, Jianfu SHAO Numerical prediction of thermal weakening effects on granite rock 11:00 a.m.

GSI or JRC - continuum or discontinuum modelling - some suggestions and some critique Nicholas Ryland BARTOI

A numerical analysis of weakening of a granitic rock by piezoelectric Rafael Arturo RUBIO RUIZ, Timo SAKSALA, Alexandre KANE, Mikko

Modelling the hydro-mechanical behaviour of a 3D rough-walled rock joint

Fluid injection influence on fracture propagation near an under-

Mohammad Youssef FALLAH SOLTANABAD, Amade POUYA, Lina Maria GUAYACAN CARRILLO, Laurent BROCHARD, Christophe DE LESOUEN. Minh-ngoc VU Mathematical model to describe the movement of rocks

due to gravity in block caving mining Numerical simulation of THM coupled behavior in the high-level radioactive waste disposal using OGS-FLAC

Modelling time-dependent processes resulting from thermo-viscoelastic behaviour of rocks Donát M. TAKÁCS, Tamás FÜLÖP, Áron POZSÁR, Róbert KOVÁCS, Mátvás SZÜCS. Peter VÁN

Taehyun KIM, Chan-Hee PARK, Changsoo LEE, Jin-Seop KIM

Probabilistic assessment of rock loads for tunnel support design voo AHN, Jurij KARLOVŠEK, Adrian SMITH

The effect of different rock mass properties on deformation distribution detected with intelligent rock bolts in under**ground mining**Michel VARELIJA, Michael NÖGER, Philipp HARTLIEB, Peter MOSER,

Seismic velocity estimation using a digital rock without segmentation - tips for accurate calibration and estimation Kazuya ISHITSUKA, Hitoshi MATSUI, Weiren LIN, Nana KAMIYA, Yoshitaka NARA