

## Parallel sessions

(\* The **bold name** is the presenter)

### Session A1: Laboratory dynamic testing of rock

*W. Dang, H. Konietzky & T. Frühwirt*

Shear behavior of planar rock joints under dynamic normal load (DNL) conditions

*S. Mishra, T. Chakraborty, V. Matsagar & D. Basu*

Experimental characterization of Himalayan limestone

*T. Zhou & J.B. Zhu*

Monitoring of damage evolution in granite under uniaxial compression by AE and P-wave velocity

*K. Liu, Q.B. Zhang & J. Zhao*

Dynamic increase factors of rock strength

*S.W. Oh, G. J. Min, S.W. Park, S. H. Cho & Y. H. You*

Dynamic Mode II fracture toughness determination of rocks with short cores in compression method

### Session A2: Rockburst, seismicity and seismic monitoring

*Meifeng CAI*

Inducing mechanism of rockburst with its prediction and prevention principle in metal mines

*T. Zvarivadza & F. Sengani*

Practice of face-perpendicular preconditioning for safe remnant extraction

*C.C. Li, D. Sandström & A. Nyström*

Rock fracturing related to strain burst in quartzite rock mass

*F. Sengani & T. Zvarivadza*

The development and optimization of face-perpendicular preconditioning technique for development ends

### Session A3: Theoretical study and numerical modelling

*T. Saksala*

Numerical study on the strain-rate sensitivity of rock: meso-mechanical approach

*B. Wu, Q. Wang & K. Xia*

Application of dominant crack algorithm (DCA) to dynamic tensile failure of rocks

*B.H.V. Sekar & S. R. Naik*

Dynamic rock slope stability analysis using UDEC software

*O. Vardar, C. Zhang, F. Tahmasebinia, I. Canbulat & B. Hebblewhite*

DEM analysis of the effect of discontinuities on coal mass brittleness

*X. Li, Q.B. Zhang, J. Zhao & J.C. Li*

A numerical study of spalling under different dynamic loads using PNMM

### Session B1: Laboratory dynamic testing of rock

*D.Y. Li, Z.Y. Han, X.B. Li, X.L. Sun, Y. Shi, & T. Zhou*

Dynamic tests of marble specimens with artificial defects under impact loading by SHPB

*M. Tao, H.T. Zhao, Z.W. Li, A. Ma, Z.X. Hong & S.F. Ren*

Stress redistribution of dynamic loading incident through a pre-stressed cavity

*W. Wang, H. Wang, H.Z. Zang, H.M. Li & D.Y. Li*

Experimental study of strength characteristics of coal specimens under static and dynamic loadings

*C.L. He & J. Yang*

Dynamic characteristic of rock under in-situ stress and blast loading

*L. Shi, X. Zhang & C.C. Li*

Deformation characteristics of Beishan granite under low-cyclic loading

*M.W. Zhang, S.D. Liu, Q.B. Meng, D.Y. Qian & N. Zhang*

Rock energy evolution under triaxial cyclic loading-unloading compression

## **Session B2: Dynamic rock support**

*A. Punkkinen, B. Forbes, A. Hyett & J. Whitmore*

Monitoring pillar behaviour while driving towards a Shear Zone in highly stressed ground at Vale's Creighton Mine

*A. Stiehl, B. Darlington, M. Rataj & P. Young*

Application of the MD bolt in the Fosterville Gold Mine

*P. Mikula & B.M. Brown*

The need for additional dynamic testing methods for ground support elements

*F. Sengani & T. Zvarivadza*

Dynamic test of flexi-bolts reinforcement system and its performance in hard rock underground mining

*G. Knox & A. Berghorst*

Increased agility for the research and development of dynamic roof support products

*K. Bosman, M. Cawood & A. Berghorst*

Relationship between energy per impulse and dynamic capacity of a rockbolt

## **Session B3: Theoretical study and numerical modelling**

*K.K. Panthi & C.B. Basnet*

A dynamic stress state analysis at the pressure tunnel of Upper Tamakoshi HPP, Nepal

*X.F. Li, H.B. Li, Q.B. Zhang & J. Zhao*

Research on the dynamic behaviour of rock material: rate dependency and pulverization

*X.L. Liu, G.Y. Zhao, J.H. Cui, X.B. Li & Q. Guo*

Analysis of elastic wave attenuation in different rock samples

*A. Bolin & R. Ghazal*

Sensitivity analysis of block stability under seismic loading

## **Session B4: Other relevant topics**

*S. Wu, H. L. Ramandi, P. C. Hagan, S. Saydam & B. Hebblewhite*

Experimental protocol for stress corrosion cracking for full-size cable bolts

*Z.G. Ma, N. Cui & P. Gong*

Support Mechanism of 4D Force-transferring Block Set

*F. Sengani & T. Zvarivadza*

The performance of mechanical anchors in South African mechanized deep level gold mining

*C.D. Su, H.Z. Zang, J.Q. Guo, Y.N. Sun, C.S. Song & W. Wang*

Shear behavior and acoustic emission characteristics of regular dentate joint

*T. Zvarivadza & F. Sengani*

Evaluation of in-stope pillar failure: a case study of deep to ultra-deep level gold mining in South Africa

*G. Bonci*

Case studies related to real time geotechnical monitoring systems for an open pit coal mine in Western Canada

## **Session C1: Earthquake damage & blasting**

*W.G. Qiu*

Seismic effect and aseismic in mountain tunnels

*C.C. Xia, F. Xue & J.K. Gao*

A case study of determining the safety threshold of blasting vibration for tunnel lining

*L. Chi, A. Aalberg, Z.X. Zhang & C.C. Li*

An experimental investigation on dynamic responses of granite blocks under blast loading

*H. Zhou & X.H. Wang*

Seismic response of a tunnel embedded in compacted sand through large-scale shake table testing

*X.P. Zhang & Y.J. Jiang*

Dynamic response of a shallow tunnel with imperfect interface in anisotropic medium

*J.T. Chen, H.T. Yu & Y. Yuan*

Seismic response of shallow buried rock tunnel: shaking table test and numerical simulation

## **Session C2: Rockburst, seismicity and seismic monitoring**

*J. Deng*

Dynamic buckling mechanism of pillar rockbursts induced by stress waves

*A.K. Khan, G. Peach, G.A. Rosario, H.-S. Xioang, X.-T. Feng, B. Chen, Y. Xiao & G. Feng*  
Microseismic monitoring in twin TBM tunnels in the Lower Himalayas

*G. Peach, G.A. Rosario, H.-S. Xiong & X.-T. Feng*

Comparison of microseismic monitoring and actual rockbursts in twin TBM tunnels in the lower Himalayas

*Z. Khademian & U. Ozbay*

A numerical modeling methodology for assessing rock failure stabilities

*L.A. Nazarova, V.N. Zakharov, L.A. Nazarov, V.L. Shkuratnik, M.I. Protasov & P.V. Nikolenko*

Stress evolution and induced seismicity in mining: lab test, observation and modeling

## **Session C3: JRDC-SS1: Experimental studies and wave propagation**

(JRDC-SS = Japan Rock Dynamic Commission Special Session)

*Ö. Aydan, N. Tokashiki, N. Z. Nasiry, N. Iwata & R. Kiyota*

Two-ways dynamic shear testing of rock discontinuities

*T. Nishimura, M. Kohno & K. Fumimura*

Numerical simulations on failure and stress wave propagation in solid materials using a 3D lattice spring model

*Ö. Aydan, F. Ito & T. Ito*

Dynamic response of support systems during the excavation of underground openings

*Y. Takahashi, N. Iwata, R. Kiyota, K. Adachi, Ö. Aydan & N. Tokashiki*

Dynamic stability of rock slopes and the effect of reinforcement against planar sliding

*R. Kiyota, N. Iwata, Y. Takahashi, K. Adachi & Ö. Aydan*

Stick-slip behavior of rock discontinuities by difference in rock types

*M. Ishimaru, A. Sekiguchi, T. Okada, K. Hiraga & K. Ozawa*

Experimental study on seismic stability of foundation rocks under critical facilities

*T. Okada & T. Naya*

Validation of a mathematical model for evaluating the dynamic shear strength of rock

## **Session D1: Laboratory dynamic testing of rock**

*Z. Q. Yin, Z. D. Wei, Z. Zhang, J. C. Chang, C. M. Li, H. F. Ma, G. M. Zhao, X. Y. Zhang, W. B. Shi & M. Tu*

Development of impact loading test device for gas-containing coal

*H. Yang, H.F. Duan & J.B. Zhu*

Effects of water-filled rock joints on ultrasonic P-wave propagation

*Q.B. Lin, P. Cao & Y. Chen*

Study on rock breakage by disc cutter under coupled static and dynamic loads

*S. Yasar*

Simple rock cutting testing

*Q.H. Rao, W.D. Liang & H.L. Zhao*

Dynamic shear (Mode II) fracture toughness testing of brittle rock with punch-through cylindrical specimens

*H.Z. Xing, G.L.N. Wu, Q.B. Zhang, J. Zhao & S. Dehkhoda*

A preliminary study of using high-speed digital image correlation (DIC) to characterize the penetration on geomaterial

*X. Cai, Z.L. Zhou, D. Ma, X.B. Li & G.Y. Zhao*  
Dynamic fracture behavior of dry and saturated sandstone

## **Session D2: Dynamic rock support**

*B. Darlington, M. Rataj, G. Balog & D. Barnett*  
Development of the MDX Bolt and in-situ dynamic testing at Telfer Gold Mine

*W. Breure, D.J.M. Ngan-Tillard & C.C. Li*  
Towards improved design of rock reinforcement systems in burst-prone rock masses

*X.W. Feng*  
Mechanical response of fully bonded bolts under cyclic loading

*T. Zvarivadza & F. Sengani*  
Garford hybrid dynamic bolt reinforcement system on trial in deep level gold mines of South Africa

*S.H. Chen & S.W. Hu*  
Dynamic response of rock bolts to blasting vibrations

## **Session D3: JRDC-SS2: Earthquake related topics**

(JRDC-SS = Japan Rock Dynamic Commission Special Session)

*T. Seiki, T.K.M. Dintwe, R. Yamaguchi, S. Noguchi & T. Ohmura*  
Seismic characteristics of field measurements and numerical analyses of an underground quarry in Oya

*K. Kamemura & Ö. Aydan*  
Some considerations on the stability and design of underground structures during earthquakes

*Ö. Aydan, J. Tomiyama, H. Matsubara, N. Tokashiki & N. Iwata*  
Damage to rock engineering structures induced by the 2016 Kumamoto earthquakes

*N. Tokashiki, Ö. Aydan, N. Z. Nasiry, T. Ito & M. Geniş*  
Dynamic response and stability of some historical masonry structures subjected to ground shaking

*N. Iwata, R. Kiyota, et al. K. Adachi, Y. Takahashi, Ö. Aydan, F. Miura & T. Ito*  
Simulation of strong motions and surface rupture of the 2014 Northern Nagano Earthquake

*T. Sato, K. Aoyagi, Y. Matsuzaki, N. Miyara & K. Miyakawa*  
Status of rock dynamics study in Horonobe Underground Research Laboratory, Japan

*Masaaki Wani*  
Design and performance of the foundation of the tsunami protection wall at the Hamaoka Nuclear Power Station

## Poster presentations

*T.H. Ma & C.A. Tang*

Rockburst prediction mechanics and analysis on typical cases based on microseismic monitoring technique in tunneling

*N.N. Kuznetcov, I.V. Fedotova & A.K. Pak*

Strain and energy parameters of burst-prone rocks: study and analysis

*A.A. Kozzyrev, E.V. Kasparyan & Iu.V. Fedotova*

Monitoring of mining-induced seismicity in the Khibiny rock massif

*N.W. Xu, F. Dai, T. Zhao, Z. Zhou & C. Sha*

Forecast the deformation of the surrounding rock using MS monitoring

*F.Q. Gong, S. Luo, L. Zhang & D.H. Lu*

Fracture characteristics of rock under coupled static pre-load and impact disturbance

*D. Zhang & S. Huan*

Assessment of the damage of metro tunnel precise delay blasting to building structures

*C. Zhang, F. Tahmasebinia, I. Canbulat, O. Vardar & S. Saydam*

Effects of the joint density and joint dip angle on the fracture energy in coal mass

*L.G. Wang, G.C. Zhao, Y.H. Xi & Q. Chen*

A study on the dynamic feedback characteristics of the slip body during sliding

*X.F. Liu, N. Zhao & W.B. An*

Collapse experiment and numerical simulation of a slope under strong earthquake

*A.V. Zemtcovskii, N.N. Kuznetcov & K.N. Konstantinov*

Determination of the specific rock failure energy at various structural-scale levels