

AfriRock International Symposium—Preliminary Programme

Conference Day 1— Plenary Ballroom East

3 October 2017—Tuesday

- 07:30–08:30 Registration and early morning refreshments
08:30–08:35 Emergency Procedures—CTICC
08:35–08:40 Opening Ceremony
W.C. Joughin, *Conference chairperson and ISRM VP for Africa*
08:40–08:45 ISRM President
E.F. de Quadros
08:45–09:00 SAIMM President
S. Ndlovu
09:00–09:15 Status of the ISRM
L. Lamas, *Secretary General*
09:15–09:50 Rocha Medal Award and Lecture: Investigating the evolution of rock discontinuity asperity degradation and void space morphology under direct shear
B. Tatone

SUPPORT DESIGN—BALLROOM EAST

- 13:30–13:45 Support method for underground engineering in hard rock with high geostress: a case study of the Baihetan hydropower project, China
Q. Jiang*, X-T. Feng*, Q. Fan†, Y. Fan†, J. Xu†, and H. Chen†, *Institute of Rock and Soil Mechanics, China, †China Three Gorges Project Corporation, China
13:45–14:00 Support design for tunnels with deep overburden in weak rock
W. Schubert, *Graz University of Technology, Austria*
14:00–14:15 Parameters required for the design of rock support in high-stress rock masses
C.C. Li, *Norwegian University of Science and Technology, Norway*
14:15–14:30 Stable span re-design and support optimization for a shallow hard-rock bord-and-pillar mine on the Great Dyke: the case of Unki Mine, Zimbabwe
O. Mandingaisa* and C. Musa†, *Anglo American, South Africa, †Unki Mines, Zimbabwe
14:30–14:45 Improving mining efficiencies by means of a new support design at Unisel Gold Mine, Welkom, South Africa
P.M. Couto, *Brentley, Lucas and Associates Mining Consultants, South Africa*
14:45–15:00 Numerical simulation of fully grouted rockbolts by considering nonlinear bond-slip behaviour
S. Ma, Z. Zhao, and W. Nie, *Nanyang Technological University, Singapore*
15:00–15:15 Mining with crush pillars
M. du Plessis* and D.F. Malan†, *Lonmin Platinum, Marikana, South Africa, †University of Pretoria, South Africa
15:15–15:30 Use of plastic composites as friction rockbolt materials
E. Komurlu and A. Kesimal, *Karadeniz Technical University, Turkey*
15:30–15:45 Preliminary investigation of the effect of areal shape on pillar strength
J. Maritz, *University of Pretoria, South Africa*
15:45–16:00 Mid Afternoon Refreshments

SURFACE MINING SLOPE STABILITY—BALLROOM EAST

- 16:00–16:15 Slope design considerations for shallow open pit mines: a case study at Mamatwan Mine, Northern Cape Province, South Africa
S.N. Epiga and S.M. Rupprecht, *University of Johannesburg, South Africa*
16:15–16:30 Identification of potential rock wedge controlled rockfalls using groundbased LiDAR Techniques: A case study in Eastern Taiwan
M-C. Tsao and T-T. Wang, *National Taipei University of Technology, Taiwan*
16:30–16:45 Optimization of slope design in Saprolites at Kansanshi Mine
T.O. Moore, *First Quantum Minerals Limited, Zambia*
16:45–17:00 Techniques for measuring three-dimensional displacement vector using ground-based interferometric synthetic aperture radar
C. Thomson*, N. Coli†, and L. Leoni†, *Hexagon Mining, South Africa, †IDS GeoRadar part of Hexagon, Italy
17:00–17:15 Otjikoto gold mine – a case study in pit slope design
O. Pillay, R. Armstrong, and P.J. Terbrugge, *SRK Consulting, South Africa*
17:15–17:30 A holistic open pit mine slope stability index using artificial neural networks
M. Fakir and M. Ferentinou, *University of Johannesburg, South Africa*
17:30–17:45 The significance of identifying potential failure mechanisms from conceptual to design level for open pit rock slopes
C. Romer* and M. Ferentinou†, *University of KwaZulu-Natal, South Africa, †University of Johannesburg, South Africa
17:45–18:00 Investigation of failures associated with a major shear zone in the Main Pit Cut 3 West, at Letšeng Diamond Mine, Lesotho
N. Lef*, E.D.C. Hingston†, and N. Lephatsoe*, *Letšeng Diamonds, Lesotho, †University of Kwazulu-Natal, South Africa

SEISMICITY (continued)—MEETING ROOM 2.41–2.46

- 15:45–16:00 Location and source mechanism of a microseismic event in a mine using a single seismogram
R.A. Lynch*, S. Jackson†, S. Brijraj†, and S. Moolla†, *Institute of Mine Seismology, Australia, †University of Tasmania, Australia, ‡University of KwaZulu-Natal, South Africa
16:00–16:15 Calibration of modelled seismicity in South African mines using a potency-based method
J. Gerber and S. Kohler, *Institute of Mine Seismology, South Africa*
16:15–16:30 Technology transfer for minimizing seismic risk in South Africa's platinum mines, F. Essrich*, J.W.L. Hanekom†, and J. Bower‡, *SIM Mining Consultants, South Africa, †Middindi Mining Consultants, and University of Pretoria, South Africa, ‡Simulated Training Solutions, South Africa
16:30–16:45 Microseismic monitoring and stability analysis of the deep underground caverns at Lianghekou hydropower station, southwest China
A. Li*, F. Dai*, Z. Zhou†, C. Sha†, and N. Xu*, *Sichuan University, China, †Powerchina Chengdu Engineering Corporation Limited, China
16:45–17:00 Microseismic monitoring, warning and mitigation of rockburst in the deep tunnels of NEELUM-JHELUM Hydroelectric project, Pakistan
G-L. Fen*, X-T. Feng†, B-R. Chen*, Y-X. Xiao†, P-X. Li†, and S. Tan*, *Chinese Academy of Sciences, China, †Northeastern University, China*
17:00–18:30 ISRM Advisory Forum—Meeting Room 1.43 and 1.44

- 09:50–10:30 Franklin Lecture – Numerical modelling of tabular excavations: Old problems and new solutions
F. Malan
10:30–11:00 Mid Morning Refreshments
11:00–11:30 Keynote Session: Rock engineering as a creator of value
T.R. Stacey, *University of the Witwatersrand, South Africa*
11:30–12:00 Keynote Session: Lessons learned from large failures: multiple causes include adverse design, geology, and support
N. Barton, *Nick Barton & Associates, Norway*
12:00–12:15 Early assessment of dynamic rupture and rockburst hazard potential in deep tunnelling
M.S. Diederichs, *Queen's University, Canada*
12:15–12:30 Sponsor Presentation
New Concept Mining
12:30–13:30 Lunch

SEISMICITY—MEETING ROOM 2.41–2.46

- 13:30–13:45 Relating seismic source mechanisms to damage phenomena in platinum mines of the western Bushveld Complex
G. van Aswegen, *Mine Seismology*
13:45–14:00 Observational studies in South African mines to mitigate seismic risks: challenges and achievements
R.J. Durrheim, M.S.D. Manzi, and S. Mngadi, *University of the Witwatersrand, South Africa*
H. Ogasawara and H. Kawakata, *Ritsumeikan University, Japan*
M. Nakatani and H. Moriya, *The University of Tokyo, Japan*
Y. Yabe, *Tohoku University, Japan*
M. Naoi, *Kyoto University, Japan*
A. Cichowicz, *Council for Geoscience, South Africa*
T. Satoh, *AIST, Japan*
A. Milev, T. Kgarume, and V.Z. Brink, *CSIR, South Africa*
A.K. Ward and L. Ribeiro, *Seismogen CC, South Africa*
the SATREPS Team, *JST-JICA Science and Technology Research Partnership for Sustainable Development*
14:00–14:15 The effect of database integrity on the interpretation of routine seismic monitoring techniques
I.G. Morkel, *University of Western Australia, Australia*
14:15–14:30 Investigations of rockburst propensity of artificial samples containing different aggregates
A. Klammer, C. Peintner, M. Lagger, M. Blümel, and W. Schubert, *Graz University of Technology, Austria*
14:30–14:45 Microseismic events for slope stability analysis – a case study at an open pit mine
X. Luo*, M. Salvoni†, P. Dight†, and J. Duan*, *CSIRO Energy, Australia, †University of Western Australia, Australia
14:45–15:00 Excavation-induced seismicity: mechanism and implications
W. Wu*, Z. Zhao†, and K. Duan*, *Nanyang Technological University, Singapore, †Tsinghua University, China
15:00–15:15 Early access microseismic monitoring using sensors installed in long boreholes
T. Butler* and B. Simser†, *Engineering Seismology Group (ESG) Canada Inc., Canada, †Sudbury Integrated Nickel Operations, A Glencore Company, Canada
15:15–15:30 Drilling into seismogenic zones of M2.0 – M5.5 earthquakes from deep South African gold mines (DSeis): establishment of research sites
H. Ogasawara, A. Ishida, and H. Ogasawara, *Ritsumeikan University, Japan*
R.J. Durrheim, S. Mngadi, and M.S.D. Manzi, *University of the Witwatersrand, South Africa*
Y. Yabe and T. Ito, *Tohoku University, Japan*
G. van Aswegen, *Institute of Mine Seismology Ltd South Africa*
M. Grobbelaar, *Council for Geoscience, South Africa*
A. Funato, *Fukada Geology Institute, Japan*
M. Ziegler and N. Berset, *ETH, Switzerland*
A.K. Ward, *Seismogen CC, South Africa*
G. Hofmann, *Anglogold Ashanti, South Africa*
P. Moyer and M. Boettcher, *University of New Hampshire, USA*
P. Dight, *University of Western Australia, Australia*
W. Ellsworth, *Stanford University, USA*
B. Liebenberg, *Independent Consultant, South Africa*
N. Wechsler, *Tel Aviv University, Israel*
T. Onstott, *Princeton University, USA*
the DSeis Team
15:30–15:45 Mid Afternoon Refreshments

AfriRock International Symposium—Preliminary Programme

Conference Day 2—Plenary Ballroom East

4 October 2017—Wednesday

- 07:30–08:30 **Registration & early morning refreshments**
08:30–08:35 **Emergency Procedures - CTICC**
08:35–08:40 **Opening Ceremony**
W.C. Joughin, *Conference chairperson and ISRM VP for Africa*

UNDERGROUND MINING—BALLROOM EAST

- 09:35–09:50 **An empirical and numerical approach to quantifying raisebore-hole stability**
Y. Rajpal* and J.W.L. Hanekom*, *Middindi Consulting (Pty) Ltd, South Africa, ¹University of Pretoria, South Africa
- 09:50–10:05 **Reassessing continuous stope closure data using a limit equilibrium displacement discontinuity model**
D.F. Malan and J.A.L. Napier, *University of Pretoria, South Africa*
- 10:05–10:20 **Rockburst prevention via destress blasting of roof competent rocks in hard coal longwall mining**
P. Konicek* and J. Schreiberl*, *Institute of Geonics of the Czech Academy of Sciences, Czech Republic, ¹GreenGas, Inc., Czech Republic*
- 10:20–10:35 **A study of multi-reef pillar extraction in the Ventersdorp Contact Reef**
J.C. Esterhuysen* and D.F. Malan¹, *SibanyeGold, South Africa, ¹University of the Witwatersrand, South Africa
- 10:35–10:50 **A tool for the evaluation of departmental effectiveness**
K. Balt* and T.R. Stacey¹, *Advisian Worley Parsons Group, Sub-Sahara Africa, ¹University of the Witwatersrand, South Africa
- 10:50–11:05 **Estimation of closure by the timber pack assessment method and its comparison to modelled elastic convergence**
H. Yilmaz* and O. Rakumakoe¹, *University of the Witwatersrand, South Africa, ¹Mponeng Gold Mine, AngloGoldAshanti, South Africa
- 11:05–11:20 **Optimizing stope panel spans at an eastern Bushveld Platinum Mine by probabilistic analysis**
L.J. Gardner*, L. Bronkhorst¹, and N.L. Ayres*, *Impala Platinum Limited, South Africa, ¹Marula Platinum Mine, South Africa
- 11:20–11:35 **Discrete element modelling of rock-cutting experiments under confining pressure**
N. Gonze and J-P. Tshibangu, *University of Mons, Mons, Belgium*
- 11:35–11:50 **Time dependent failure of open stopes at Target Mine**
P.J. le Roux and K.R. Brentley, *Brentley, Lucas and Associates, South Africa*
- 11:50–12:05 **A remote sensing approach workflow for the derivation of numerical modelling input data: insights from the Hope Slide, Canada**
D. Donati¹, D. Stead*, M-A. Brideau², and M. Ghirotti³, *Simon Fraser University, Canada, ¹BGC Engineering, Canada, ²University of Ferrara, Italy
- 12:05–13:00 **Lunch**

TUNNELS AND CAVERNS—BALLROOM EAST

- 13:00–13:15 **Microseismicity-based feedback analysis of the stability of deep underground caverns at the Houziyan hydropower station, China**
B. Li*, Z. Zhou¹, C. Sha¹, N. Xu¹, and F. Dai* *College of Water Resources and Hydropower, Sichuan University, China, ¹Powerchina Chengdu Engineering Corporation Limited, P.R. China*
- 13:15–13:30 **Dam foundation curtain grouting management based on 3D geological model and monitoring system**
K. Fan*, Y. Wang*, Q. Fan*, Bingyu Ren¹, *China Three Gorges Corporation, China, ¹Tianjin University, China
- 13:30–13:45 **Cautious blast design and practice in close proximity to a railway tunnel and residential buildings**
H.A. Bilgin*, Y. Daganan¹, and B. Unluturk*, *Middle East Technical University, Turkey, ¹Curtin University, Australia, ²Polyak Energy Coal Mine, Turkey
- 13:45–14:00 **Issues related to the long-term stability of unlined water tunnels of Norwegian Hydropower – a review of a case**
K.K. Panthi, *Norwegian University of Science and Technology (NTNU), Norway*
- 14:00–14:15 **Failure mechanism of karst cave wall during tunneling**
J. Wang^{1,2,3}, Y. Deng*, L. nbo Wu*, X. Liu*, Y. o Yin*, and W. Liu*, *Tongji University, China, University of Mining & Technology, China, ¹State Key Laboratory for Geo Mechanics and Deep Underground Engineering, China, ²Key Laboratory of Geotechnical and Underground Engineering of Ministry of Education, China
- 14:15–14:30 **Afternoon Refreshments**
- 14:30–14:45 **Geotechnical design refinement in parallel with construction - Boschkop Abstraction Works, South Africa**
A.T. Morgan, *Geotechnical Engineers, Geoid Geotechnical Engineers, South Africa*
- 14:45–15:00 **Slope stabilization and rock support at Metolong Dam, Lesotho**
A.S. Sithole and M. Wainstein, *Gibb Consulting Engineers Pty Ltd, South Africa*
- 15:00–15:15 **Feedback analysis and real-time supporting method for large underground hydraulic caverns under high geo-stress condition: A case study of Chinese Baihetan underground powerhouse**
Q. Fan*, Q. Jiang¹, and X. Duan*, *China Three Gorges Corporation, China, ¹Institute of Rock and Soil Mechanics, Chinese Academy of Sciences

- 08:40–09:10 **Keynote Session: Stress measurements for underground power-houses - three recent cases**
L. Lamas*, M. Espada*, Bruno Figueiredo¹, and J. Muralha*, *National Laboratory for Civil Engineering – LNEC, Portugal, ¹Uppsala University, Sweden
- 09:10–09:20 **Sponsor Presentation**
IDS GEORADAR SRL
- 09:20–09:35 **Mid Morning Refreshments**

INVESTIGATION TECHNOLOGY—MEETING ROOM 2.41–2.46

- 09:35–09:50 **The determination of crustal stress orientation based on the borehole geometric shape using panoramic stereopair imaging technology**
C. Wang, X. Zou, and Z. Han, *Chinese Academy of Sciences, China*
- 09:50–10:05 **The sub-surface profiler: a giant leap for ground penetrating radar**
A. Pienaar, *Reutech Mining, South Africa*
- 10:05–10:20 **Rock failure modes under uniaxial compression and indirect tension**
A. Basu, *Indian Institute of Technology India*
- 10:20–10:35 **Innovative technologies for monitoring underground excavations during construction and operational**
A. Carri, L. Chiapponi, R. Savi, and A. Segalini, *University of Parma, Italy*
- 10:35–10:50 **An acoustic approach to the estimation of rock mass state and prediction of induced seismicity parameters: theory, laboratory experiments, and case study**
L.A. Nazarova, L.A. Nazarov, V.L. Shkuratnik, M.I. Protasov, and P.V. Nikolenko, *Russian Academy of Science, Russia*
- 10:50–11:05 **Experimental studies of variably saturated flow from a horizontal discontinuity to the vertical with and without an intersection**
B.R. Jones*, L.B. Brouwers¹, M.A. Dippenaar², and J. Louis Van Rooy³, *GaGE Consulting (Pty) Ltd, South Africa, ¹Fugro Middle East, United Arab Emirates, Dubai, ²University of Pretoria, South Africa
- 11:05–11:20 **Design of an *in situ* testing device for the backfill of mechanized driven tunnels in hard rock**
M. Lagger, M.R. Henzinger, and W. Schubert, *Graz University of Technology, Austria*
- 11:20–11:35 **Analytical and experimental investigation of the hard rock indentation process**
S. Souissi and E. Hamdi, *Université de Tunis El Manar, Tunisia*
- 11:35–11:50 **Characterizing microtremor signals of a slope with deep-seated gravitational deformation**
Y.C. Chiu, P.C. Lo, T.T. Wang, *National Taipei University of Technology, Taiwan*
- 11:50–12:05 **Progress of brittle micro-fracturing in crystalline rocks under cyclic loading conditions**
E. Ghazvinian* and M.S. Diederichs¹, *Mine Design Engineering, Canada ¹Queen's University, Canada
- 12:05–12:20 **InSAR monitoring for mines: an integrated approach**
D. Colombo*, F. Bellotti*, P. Farina*, A. Jonson¹, and I. du Toit¹, *TRE AL-TAMIRA, Italy, ¹Optron (Pty), South Africa
- 12:20–13:20 **Lunch**

EARLY CAREER FORUM—MEETING ROOM 2.41–2.46

- 13:20–14:15 **Early Career Forum**
14:15–14:30 **Afternoon Refreshments**
14:30–15:30 **Early Career Forum**

- 18:00–18:30 **Transport from CTICC to the Castle**
19:00–22:00 **Conference Dinner**
22:00–22:30 **Transport to CTICC**

AfriRock International Symposium—Preliminary Programme

Conference Day 3—Plenary Ballroom East

5 October 2017—Thursday

- 07:30–08:30 Registration & early morning refreshments
08:30–08:35 Emergency Procedures - CTICC
08:35–08:40 Opening Ceremony
W.C. Joughin, *Conference chairperson and ISRM VP for Africa*

NUMERICAL MODELLING—BALLROOM EAST

- 09:45–10:00 **A multi-objective hybrid prediction model of slope deformation based on fuzzy optimization algorithm**
J.B. Zhu and C. Li, *Yangtze River Scientific Research Institute, China*
- 10:00–10:15 **Benchmarking of debris flow experimental tests using combined finite-discrete element method FEMDEM**
F. Vagnon*, A.M. Ferrero*, J.P. Latham¹, and J. Xiang[†], **University of Turin, Italy*, ¹*Imperial College of London, London*
- 10:15–10:30 **Numerical model calibration: process or luck?**
J.W.L. Hanekom** and B.C. Okhuis[†], *Middindi Consulting (Pty) Ltd, South Africa*, [†]*University of Pretoria, South Africa*
- 10:30–10:45 **Modelling rock salt dissolution in the foundation of a large dam**
C. Vibert*, J. Schittekat[†], and V. Libaud*, **Tractebel-Coyne et Bellier, France*, [†]*University of Leuven, Belgium*
- 10:45–11:00 **Calibration of a numerical model for bore-and-fill mining**
D.P. Roberts, *CSIR/Anglogold Ashanti, South Africa*
- 11:00–11:15 **Comparison of observational, empirical and 3D discrete numerical methods to estimate subsidence over longwall coal faces**
I. Pérez-Rey*, L.R. Alejano*, and P. Velasco[†], **University of Vigo, Spain*, [†]*Itasca Consulting group, Spain*
- 11:15–11:30 **Characterization and numerical modelling of standard and cabled-strapped pillars in a hematite mine**
L.R. Alejano*, U. Castro-Figueira*, I. Pérez-Rey*, F. García-Bastante*, and J. Arzúa[†], **University of Vigo, Spain*, [†]*Universidad Católica del Norte, Chile*
- 11:30–11:45 **Numerical simulation of hydraulic fracturing process on mixed ground**
J. Wang**^{††}, Y. Deng*, X. Liu*, H. Peng[†], Y. Yin[†], L. Wu*, Z. Wu[§], **Tongji University, China*, [†]*State Key Laboratory for Geo Mechanics and Deep Underground Engineering, China*, ^{††}*Key Laboratory of Environment Protection & Safety in Foundation Engineering of Transportation, China*, [§]*East China Architectural Design & Research Institute, China*
- 11:45–12:00 **Geotechnical characterization and revision of the pillar design for a hard-rock bord and pillar mine**
J. Walls** and P. Mpunzi*, **SRK Consulting (Pty) Ltd, South Africa*, [†]*JeWal Geotechnical (Pty) Ltd, South Africa*
- 12:00–12:15 **A comparison between LEM and FEM based sensitivity analysis for a soil slope**
A. Singh, T. Singh, K.S. Rao, and E.T. Chala,
- 12:15–13:30 **Lunch**

UNDERGROUND MINING—BALLROOM EAST

- 13:30–13:45 **Assessment of the potential to extract hard rock strike pillars to improve overall extraction ratio**
K.B. Le Bron*, P. Piper[†] and G. Judeel[‡], **MLB Consulting, South Africa*, [†]*Groundwork Consulting, South Africa*, [‡]*Geosindile, South Africa*
- 13:45–14:00 **Coal pillar stooping – assessing the stability of snooks**
S.Z. Pethö*, K.B. Le Bron[†] and C.Selai*, **Glencore Coal, South Africa*, [†]*MLB Consulting, South Africa*
- 14:00–14:15 **Review of remnant mining practices in South African Gold Mines**
T. Rangasamy* and H. Yilmaz[†], **Middindi Consulting, South Africa*, [†]*University of the Witwatersrand, South Africa*
- 14:15–14:30 **Geotechnical input into shaft sinking on the Platreed project**
A. Cooper, A. Brits, A. Mbongonya, F. Fredericks, and T. Hudson, *Ivanplats, South Africa*
- 14:30–14:45 **Fundamental understanding of underground pillar design processes and methods**
J.W.L. Hanekom**^{††}, *Middindi Consulting (Pty) Ltd, University of Pretoria, South Africa*
- 14:45–15:00 **Performance evaluation of the Paboase crown pillar at Chirano Gold Mines in Ghana**
E.O. Mensah* and J.J. Ran[†], **Kinross Chirano Gold Mines Ltd, Ghana*, [†]*Kinross Gold Corporations, Canada*
- 15:00–15:15 **Stope performance assessment at the Goldcorp Eleonore Mine using bivariate analysis**
S. Guido**[†], M. Grenon[†], and P. Germain*, *Goldcorp-Eleonore Mine, Canada*, [†]*Université Laval, Canada*
- 15:15–15:30 **Design of stoping sequence at deeper horizons for a lead-zinc mine in a sheared rock mass**
J.L. Porathur*, C.P. Verma*, S. Dutta[†], and A. Jha[†], **CSIR-Central Institute of Mining & Fuel Research (CIMFR), India*, [†]*Hindustan Zinc Limited, India*
- 15:30–15:45 **Coal pillar stooping – partial extraction of coal pillars ensuring panel stability**
K.B. Le Bron*, L. Sekwele[†], and D. Snyman[†], **MLB Consulting, South Africa*, [†]*Exxaro South Africa*
- 15:45–16:00 **Afternoon Refreshments**
- 16:00–16:15 **Best paper and Young Participant's Awards**
- 16:15–16:30 **Closing Ceremony**
W.C. Joughin, *Conference chairperson and ISRM VP for Africa*
- 16:30–16:45 **The ISRM VP for Africa 2018 ISRM International Symposium in Singapore (10-15 min)**

- 08:40–09:10 **Keynote Session: How rock mechanics can help oil well drilling – Latest developments**
S. Fontoura, *PUC-Rio, Brazil*
- 09:10–09:20 **Sponsor Presentation**
Reutech
- 09:20–09:30 **Sponsor Presentation**
Optron
- 09:30–09:45 **Mid Morning Refreshments**
- ### GEOTECHNICAL INVESTIGATIONS—MEETING ROOM 2.41–2.46
- 09:45–10:00 **Geomechanical evaluation enabled stimulation optimization of a tight gas reservoir in Egypt**
M. Salah*, A. Abdel-Meguid[†], B. Crane[‡], S. Squires[‡], and L. Matzar[†], **Khalda Petroleum, Egypt*, [†]*Halliburton, Egypt*, [‡]*Halliburton, United States*
- 10:00–10:15 **Experience gained from *in situ* stress measurements conducted in Southern Africa during the past ten years**
M.F. Handley*, P. Piper*, H. Kato[†], and T. Clements[†], **Groundwork Consulting, South Africa*, [†]*3D-Geoscience, Japan*
- 10:15–10:30 **Advanced information on rock mass properties in large open pits by analysing production drill rig parameters in real time**
P. Piper*, K. Bro[†], and P. Martensson[†], **Groundwork Consulting, South Africa*, [†]*Rockma Systems, Sweden*
- 10:30–10:45 **Unravelling the structural mysteries of the Bermuda Triangle at Lonmin's Saffy Shaft**
A.G. Hartzenberg*, M. du Plessis*, and A.E. W. Friese[†], **Lonmin Platinum Platinum Ltd, Marikana, South Africa*, [†]*Terra Explora Consulting, South Africa*
- 10:45–11:00 **The influence of geological structures – an often-overlooked important aspect affecting the stability of operating mines**
G.C. More O'Ferrall* and M. du Plessis[†], **First Quantum Minerals Limited, Zambia*, [†]*Lonmin Platinum Platinum Ltd, Marikana, South Africa*
- 11:00–11:15 **Development of a rock mass quality model for an open pit mine**
M. Morales*, K.K. Panthi[†], and K. Botsialis[†], **Norwegian University of Science and Technology (NTNU), Norway*, [†]*The Mining Company, Norway*
- 11:15–11:30 **Experimental study on hydraulic conductivity of a rock joint**
S-B. Choi, H-Y. Jeong, S. Lee, and S. Jeon, *Seoul National University, Korea*
- 11:30–11:45 **Geological and hydrogeological reference conditions for rock engineering: an example for grouting design at Äspö Hard Rock Laboratory, Sweden**
Å. Fransson* and J. Petersson[†], **Chalmers University of Technology, Sweden, Gothenburg, Sweden*
- 11:45–12:00 **Active ultrasonic imaging and interfacial characterization of stationary and evolving fractures in rock**
F. Pourahmadian* and B.G. Guzina[†], **University of Colorado Boulder, USA*, [†]*University of Minnesota, USA*
- 12:00–12:15 **Application of rock mass classification and blastability index for improving wall control at a hard-rock mine in Botswana**
G. Segae[†] and T. Zvarivadza, *The University of the Witwatersrand, South Africa*
- 12:15–13:30 **Lunch**
- 13:30–13:45 **Keyblock stability analysis of longhole stopes**
D. Sewnun* and W.C. Joughin*, R. Armstrong*, and A. Cooper[†], **SRK Consulting (Pty) Ltd, South Africa*, [†]*Ivanplats (Pty) Ltd, South Africa*
- 13:45–14:00 **An investigation on the relationships between the petrographic, physical and mechanical characteristics of sandstones from Newspaper Member of the Natal Group using self organized maps**
M. Ferentinou, *University of Johannesburg, South Africa*
- 14:00–14:15 **Collection and processing of geotechnical data as part of a stoping panel span optimization study at an Eastern Bushveld Platinum Mine - A case study from Impala Platinum Limited**
L.J. Gardner*, L.U. Bronkhorst[†], and N. Ayres*, **Impala Platinum Limited, South Africa*, [†]*Marula Platinum Mine, South Africa*
- 14:15–14:30 **A petrographic and geotechnical investigation of the sandstone parting between the Alfred seam and the Gus seam in the Magdalena Colliery Dundee, South Africa**
T. Keman*, E.D.C. Hingston[†], and S. Mtshali[†], **University of KwaZulu-Natal, South Africa*, [†]*Buffalo Coal, South Africa*
- 14:30–14:45 **A case study: remediation of abandoned mines for residential development**
I.S. Oweis*, G. Gartenberg[†], and L. Oweis*, **Oweis Engineering Inc, USA*, [†]*The Falcon Group, USA*
- ### PETROLEUM—MEETING ROOM 2.41–2.46
- 14:45–15:00 **Hydraulic fracturing in plastic deformed low-permeability reservoirs**
Y. Wang* and F. Karaoulanis[†], *Petro-, Geotech Inc., Canada*, [†]*Petro-, Geotech Inc., Greece*
- 15:00–15:15 **Simulating fractured reservoirs by a coupled two phase dual porosity model**
Y. Wang, *Petro-, Geotech Inc., Canada*
- 15:15–15:30 **Stability of large underground rock caverns for crude oil storage operated below atmospheric pressure**
N. Gatelier and H.D. Nguyen, *Geostock Entrepose, France*
- 15:30–15:45 **Borehole stability and sand production in gas reservoirs**
E. Papamichos**^{††}, **Aristotle University of Thessalonik, Greece*, *SINTEF Petroleum Research, Greece, Norway*
- 15:45–16:00 **Afternoon Refreshments**