

# Accepted Abstracts\*

## Fifth International Conference on Block and Sublevel Caving

- KEYNOTE: Risk, lessons and opportunities: a unified management approach for mass mining *R Campbell, Freeport-McMoRan Inc., USA*
- Effect of drilling on the load performance of self-drilling yielding rock bolts *R Abreu, G Knox, Epiroc, South Africa*
- Experimental investigation of hydraulic fracturing in granite under hydrostatic stress conditions *Z Ali, M Karakus, The University of Adelaide, Australia*
- Integrated block cave monitoring using distributed acoustic sensing/distributed strain sensing technology *Z Anderson, Silixa Ltd, Canada*
- Surface hydraulic fracturing trial at Cadia East *G Amorer, Newcrest Mining Limited, Australia; S Duffield, Drawpoint Consulting Pty Ltd, Australia; J De Ross, Newcrest Mining Limited, Australia*
- Investigating economic and risk metrics using design of experiments in fully coupled caving geomechanics simulation *S Arndt, Dassault Systèmes, Australia; F Khodayari, D Villa, Dassault Systèmes Canada Inc., Canada; B Ndlovu, Rio Tinto, Australia*
- Stress shadowing effects during hydraulic fracturing in block caving operations *C Mejia, Tecgraf PUC-Rio, Brazil; E Azad, University of Chile, Chile; D Roehl, Tecgraf PUC-Rio, Brazil; JA Vallejos, University of Chile, Chile*
- Carrapateena cave management learnings *G Balog, OZ Minerals, Australia*
- Carrapateena block cave design and planning *Q Zhang, R Hocking, G Lagace, C Chester, OZ Minerals, Australia*
- Assessing the reasonable prospects for eventual economic extraction of a caving project *W Bennett, Mining Plus, Australia*
- In situ methodology for the performance quantification of pumpable resin based ground support systems *A Berghorst, Epiroc, Canada; C Roos, Montana Technological University, USA; D Sweet, National Institute for Occupational Safety & Health, USA; L O'Connor, Epiroc, USA; S Rosenthal, Montana Technological University, USA*
- An iterative design and schedule approach to the E22 block cave project at Northparkes Mines: a case study *K Brown, S Webster, CMOC Mining Services Pty Ltd, Australia*
- The EQUOtip hardness method for spatial geotechnical assessment *T Bruning, S Webster, CMOC Mining Services Pty Ltd, Australia*
- Cave mine gravity flow modelling considerations *I Brunton, GB Sharrock, Itasca Australia Pty Ltd, Australia*
- Benchmarking porphyry copper-gold rock masses for caveability and fragmentation decision-making *A Brzovic, C Griffiths, L Zorzi, WSP-Golder, Canada; P Ojeda, WSP-Golder, Chile; R Bewick, S Rogers, S Otto, WSP-Golder, Canada*
- Use of seismic tomography to aid rock mechanics interpretation at New Afton B3 block cave mine *D Collins, ESG Solutions, Canada; A Conley, C Kamp, New Gold Inc., Canada; T Butler, M Preiksaitis, V Shumila, ESG Solutions, Canada*
- Seismic hazards in block caving *D Beck, A Campbell, Beck Engineering Pty Ltd, Australia*
- Ten years of coupled finite element cave flow simulation in caving mines: what has changed and where to next? *D Beck, F Reusch, V Levkovitch, J Lin, A Campbell, Beck Engineering Pty Ltd, Australia*
- A global review of recovery, dilution and draw control in sublevel caving mines *A Campbell, Beck Engineering Pty Ltd, Australia*
- Effect of cave compaction in the cave propagation of the recovery level at New Afton Mine *C Cancino, Itasca Consulting Group Inc., USA; C Kamp, New Gold Inc., Canada*
- Twenty-five years of cave monitoring in New South Wales *D Carroll, Newcrest Mining Limited, Australia; L Snyman, CMOC Mining Services Pty Ltd, Australia*
- Back-analysis of gravitational flow at the MB's N01-S01 Chuquicamata underground mine *R Castro, University of Chile, Chile*
- BCRisk applications for rill swell hazard analysis in PC1: case study at Cadia East operations *R Castro, University of Chile, Chile*
- Modelling of wetmuck entry at El Teniente for long-term planning *R Castro, University of Chile, Chile*
- Planning and draw management practices for block caving *R Castro, University of Chile, Chile*
- Evaluation of the impact of blasting on the panel caving method value chain *P Cavieres, R Cardenas, Universidad de Santiago de Chile, Chile*
- Challenges of mining in squeezing ground in hard rock underground mines *B Chapula, Newcrest Mining Limited, Australia*
- Interpreting cave tracker beacon data at Carrapateena mine *C Chauvier, OZ Minerals, Australia*
- Reviewing Laubscher's empirical method to estimate subsidence limits *C Contreras, The University of British Columbia, Canada & SRK Consulting, Canada; D Elmo, The University of British Columbia, Canada; J Jakubec, A Thomas, SRK Consulting, Canada*
- A fibre-optic strain measurement system for geotechnical monitoring at OZ Minerals' Carrapateena mine *D Cox, OZ Minerals, Australia; D John, K Hoehn, Mining3, Australia; K Slee, OZ Minerals, Australia; R Kapoor, R Puscasu, Mining3, Australia*
- Geotechnical monitoring of the Carrapateena cave *D Cox, M Poulter, G Balog, T Ormerod, OZ Minerals, Australia*
- Dynamic testing: determining the relationship between rockbolt diameter and the residual dynamic capacity of an axially strained tendon *B Crompton, Epiroc; G Knox, Epiroc, South Africa*
- The need for integrated cave monitoring and analysis *D Cumming-Potvin, Australian Centre for Geomechanics, Australia*
- The B11 support methodologies and quality assurance/quality control systems: creating and implementing a traceable support system *T da Silva, BHP, Australia*
- Development of the Sandvik X-plate *B Darlington, O Vallati, P Young, Sandvik, Australia*
- Quatitative correlation of production and seismic response in block caves *W de Beer, ESG Solutions, Australia*
- Practical application of deformation-based support design *M Di Ciulli, Freeport-McMoRan Inc., USA; A Primadiansyah, PT Freeport Indonesia, Indonesia; K Taylor, Freeport-McMoRan Inc., USA; P Kaiser, Laurentian University, Canada; R Campbell, Freeport-McMoRan Inc., USA*

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## Fifth International Conference on Block and Sublevel Caving

- Geotechnical characterisation challenges for deep underground caving projects *J Diaz, BHP, Chile; R Rimmelin, BHP, Australia; C Pardo, Rio Tinto, Australia*
- Observed subsidence progression at the New Afton Mine in response to Lift 1 mining *G Dick, BGC Engineering, Inc., Canada; K Davenport, Knight Piésold Consulting, Canada; C Kamp, New Gold Inc., Canada*
- Monitoring and controls for sublevel caving in an anisotropic rock mass *R Douglas-Brown, BHP, Australia*
- Seismic risk management and monitoring of the Perseverance block cave *R Douglas-Brown, BHP, Australia*
- Mechanical-flow coupled simulation of a proposed multi-panel sublevel shrinkage *C Drover, Beck Engineering, Australia; F Basson, Newmont Australia Limited, Australia; J Lin, Beck Engineering, Australia; R Kintzel, Newmont Australia Limited, Australia; V Levkovitch, Beck Engineering, Australia*
- Assessing the stress field for the Jwaneng underground project *M Dunn, Debswana, Australia; B Boitshupo, H Chiwaye, R Harris, Debswana, Botswana*
- Developing a geotechnical model for the Jwaneng underground project *M Dunn, Debswana, Australia; H Chiwaye, K Gabanagosi, O Mogorosi, Debswana, Botswana*
- A simpler and effective numerical method to analyse different aspects of cave mechanics *D Elmo, The University of British Columbia, Canada; J Lett, Newcrest Mining Limited, Australia; K Veltin, S Rogers, WSP-Golder, Canada*
- Applications of mixed/virtual reality in cave mining *D Elmo, The University of British Columbia, Canada; D Stead, Simon Fraser University, Canada; E Onsel, SRK Consulting, Canada; O Chang, Simon Fraser University, Canada*
- Concrete: an enabler of large-scale block and sublevel cave projects globally *F Erismann, M Hansson, Sika Services AG, Switzerland*
- Mine planning: rapid construction – a key element in unlocking value in underground caves *V Fitzmaurice, Hatch, Australia*
- Development of a low sophisticated caving method in numerical simulations *E Folgoso Lozano, T Ladinig, H Wagner, M Nöger, Montanuniversität Leoben, Austria*
- Stability assessment of critical underground infrastructure using the bonded block model for caving mines *E Ghazvinian, M Fuenzalida, Itasca Consulting Group Inc., USA; C Orrego, Newcrest Mining Limited, Australia*
- Surface subsidence analysis associated with caving at a historic silver mine in Mexico *E Ghazvinian, Itasca Consulting Group Inc., USA; M Pierce, Pierce Engineering, USA; M Fuenzalida, T Garza-Cruz, Itasca Consulting Group Inc., USA*
- Application of rock mass strength scale effect at Cadia East mine *E Ghazvinian, Itasca Consulting Group Inc., USA; M Pierce, Pierce Engineering, USA; M Fuenzalida, Itasca Consulting Group Inc., USA; C Orrego, Newcrest Mining Limited, Australia*
- The impact of strength, structure and stress on the success of hydraulic fractures in a deep mining environment *D Glen, L Custodio, Newcrest Mining Limited, Australia*
- Ten year update of physical modelling in block caving *R Gómez, R Castro, University of Chile, Chile*
- Factors influencing caving *I Gray, Sibra Pty Ltd, Australia*
- Rock mass characterisation of a deep level block cave mine: Oyu Tolgoi, Mongolia *H Grobler, Rio Tinto, Mongolia; J Ekkerd, L Rwodzi, M Taylor, Rio Tinto, Australia*
- Raise caving machinery development, challenges, opportunities and current concepts *M Grynienco, Luossavaara-Kiirunavaara AB, Sweden*
- The discrete fracture network–block caving fragmentation hybrid method: a new tool to assess fragmentation of the block caving mining method *C Guajardo, J Jakubec, SRK Consulting, Canada; E Esterhuizen, Independent Consultant, USA; A Thomas, H Pichuante, SRK Consulting, Canada*
- Transition: open pit to caving in Peruvian mining *A Guzman, Universidad Nacional de San Antonio Abad del Cusco, Peru*
- Testing and evaluation of EZShot electronic detonator around local drift contours at Malmberget mine, Sweden *S Gyamfi, T Wettainen, Luossavaara-Kiirunavaara AB, Sweden*
- Characterisation of seismic activity at a kimberlite block caving operation in a complex geological setting in Quebec, Canada *R Hauta, Stornoway Diamonds, Canada; D Rebuli, Institute of Mine Seismology, Canada; S Meyer, Institute of Mine Seismology, Australia*
- Important factors affecting surface subsidence predictions using three-dimensional numerical methods *Y Hebert, GB Sharrock, Itasca Australia Pty Ltd, Australia*
- A best practice framework for inrush risk management *P Hills, pitt&sherry, Australia*
- Developing a Monte Carlo based on key block cave risks and opportunities based on a sublevel cave transitioning to a block cave *R Hocking, OZ Minerals, Australia; P Pitcher, University College London, UK*
- Ventilation requirements of cave mines *M Hooman, H Mohle, L van den Berg, BBE Consulting Australasia, Australia*
- Multiphysics modelling of fractures in porous media using the extended finite element method *A Jafari, M Vahab, N Khalili, UNSW Sydney, Australia*
- Sublevel retreat mining method: operational experiences *J Jakubec, SRK Consulting, Canada; M Van Eeden, Octea Group, Sierra Leone*
- Application of empirical methods to evaluate crown pillar failure in block caving mines *J Jarufe, University of Santiago, Chile*
- Empirical damage prediction in sublevel cave crosscuts at the Malmberget mine *T Jones, Luossavaara-Kiirunavaara AB, Sweden; D Saiang, Luleå University of Technology, Sweden*
- The Luossavaara-Kiirunavaara AB transformation: approaches for greater depths and a changing world *T Jones, L Jonsson, J Bergström, A Martikainen, H Engberg, Luossavaara-Kiirunavaara AB, Sweden*
- Damage mapping and monitoring in sublevel cave crosscuts at the Malmberget mine *T Jones, Luossavaara-Kiirunavaara AB, Sweden; D Saiang, Luleå University of Technology, Sweden*
- Design of fortification of steel frames with dynamic energy dissipators to be used in a tunnel with risk of rockbursting *A Joo, Codelco, Chile*

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## Fifth International Conference on Block and Sublevel Caving

- Evolution of the ground support system in El Teniente mine A Joo, Codelco, Chile
- Employing a comprehensive monitoring system at the west cave of New Gold's New Afton Mine C Kamp, New Gold Inc., Canada
- Rehabilitation of an extraction level drawpoint C Kamp, New Gold Inc., Canada
- Geotechnical challenges driving the mining method change: transition from sublevel open stoping to sublevel caving M Karlsson, Outokumpu Chrome Oy, Finland
- Trial mining with the raise caving mining method: one-time chance to prove the concept? M Karlsson, Luossavaara-Kiirunavaara AB, Sweden, Finland
- Material flow simulation using marker mixing F Khodayari, T Diering, Dassault Systèmes Canada Inc., Canada
- Laboratory investigation into the shear performance of self-drilling anchors G Knox, Univeristy of Toronto, Canada
- Key issues related to ore flow in raise caving L Koch, Montanuniversität Leoben, Austria
- Mining rockmass seismicity model: a numerical methodology to assess the seismic potential of a cave mine extraction layout R Lachenicht, I Brunton, GB Sharrock, Y Hebert, Itasca Australia Pty Ltd, Australia
- Raise caving: a novel mining method for deep mass mining T Ladinig, H Wagner, Montanuniversität Leoben, Austria; M Wimmer, Luossavaara-Kiirunavaara AB, Sweden
- Opening sublevel cave slot drifts at Diavik Diamond Mine P Lewis, Rio Tinto, Canada
- Simulating complex cave flow phenomena at mine-scale J Lin, F Reusch, M Mosaudian, A Campbell, Beck Engineering Pty Ltd, Australia
- A review of rockbursts associated with block caving J Liu, C Zhang, I Canbulat, S Saydam, UNSW Sydney, Australia
- Impact of draw strategy on wet muck spill severity at an operating cave mine K Llewelyn, PT Freeport Indonesia, Indonesia; S Ghadirianniari, The University of British Columbia, Canada; A Moss, Sonal Mining Technology Inc., Canada; E Eberhardt, The University of British Columbia, Canada; R Campbell, Freeport-McMoRan Inc., USA; S McDougall, The University of British Columbia, Canada
- Development, reconciliation and visualisation of hangup frequency and fines entry forecasts at PT Freeport Indonesia K Llewelyn, PT Freeport Indonesia, Indonesia; M Pierce, Pierce Engineering, USA; K Taylor, R Campbell, Freeport-McMoRan Inc., USA
- A risk-based approach to practical scope definition and management at PT Freeport Indonesia K Llewelyn, PT Freeport Indonesia, Indonesia; A Yuniar, M Di Ciolli, M Sullivan, R Campbell, Freeport-McMoRan Inc., USA
- Development of a probabilistic dynamic ground support design approach R Lowther, C Orrego, Newcrest Mining Limited, Australia; D Cuello, DC Geotech, Australia; J De Ross, Newcrest Mining Limited, Australia
- Split-level block cave footprint evaluation at the Hu'u Project S Manurung, L Gutierrez, Vale Exploration Pty Ltd, Australia
- Strategic mine planning for the Hu'u Project block cave optimisation S Manurung, O Neto, L Gutierrez, Vale Exploration Pty Ltd, Australia; D Villa, J Romero, N Soto, Dassault Systèmes, Chile
- Rock fragmentation measurements in sublevel caving: field tests at Luossavaara-Kiirunavaara AB's Malmberget mine S Manzoor, A Gustafson, H Schunnesson, Luleå University of Technology, Sweden
- Laboratory-scale dynamic test of load distribution elements at Rancagua testing facility E Marambio, WSP-Golder, Chile; G von Rickenbach, G Fischer, Geobruigg Andina SpA., Chile; JA Vallejos, L Burgos, University of Chile, Chile; R Brändle, RL Fonseca, Geobruigg AG, Switzerland
- A simulation comparison of operating strategies for electrified block cave mines S Mariager, OZ Minerals, Australia; C Eustace, K Nguyen, S Hegarty-Cremer, Polymathian, Australia; Q Zhang, OZ Minerals, Australia
- The Kiruna seismic event: important insights from the geotechnical model M Mawson, Luossavaara-Kiirunavaara AB, Sweden; A Thomas, SRK Consulting, Canada; Christina Dahnér-Lindqvist, Luossavaara-Kiirunavaara AB, Sweden
- Influence of inclined loads and blast damage on pillar stability in layouts for caving E Montiel, SRK Consulting, Chile
- Oyu Tolgoi partnership with Palantir Systems to provide effective geotechnical risk management T Moorcroft, Rio Tinto, Australia; C Deasy, Palantir Technologies, UK; E Enkhtaivan, G Watt, Oyu Tolgoi LLC, Mongolia; J Ooi, Rio Tinto, Australia; K Simanjuntak, Oyu Tolgoi LLC, Mongolia; L Cerny, Palantir Technologies, UK; M Sanaakhorol, O Dorjsuren, Oyu Tolgoi LLC, Mongolia; T Zimmerman, Palantir Techonologies, USA; V Eickhoff, Palantir Technologies, Germany
- Seismic event location uncertainty in caving IG Morkel, IGM Geotechnical, Australia; J Wesseloo, Y Potvin, Australian Centre for Geomechanics, Australia
- High-grade and high-capacity production systems for block caving mines D Morrison, Centre for Excellence in Mining Innovation, Canada
- The use of groundwater monitoring and underground pressure release tests to benefit block cave design KL Morton, KLM Consulting Services, South Africa
- Hard won lessons from the Deep Ore Zone and Deep Mill Level Zone caves A Moss, Sonal Mining Technology Inc., Canada; M Sullivan, PT Freeport Indonesia, Indonesia
- In situ stress data management and analysis: implications for numerical modelling M Musolino, C Chester, OZ Minerals, Australia
- Hydraulic fracturing for destressing in the construction of the Nuevo Nivel Minal project R Navarrete Vallejos, FH Uribe, H Godoy Ayala, Codelco, Chile
- Organising for the successful management of complex underground caving mines J Nguz Tshisens, Freeport-McMoRan Inc., USA; M Sullivan, A Yuniar, C Zimmer, T Casten, PT Freeport Indonesia, Indonesia; A Moss, Sonal Mining Technology Inc., Canada
- Geotechnical analysis and ground support selection for the Oyu Tolgoi crusher chamber #2 GB Sharrock, Itasca Australia Pty Ltd, Australia; J Ooi, Rio Tinto, Australia; B Baasanjav, Oyu Tolgoi LLC, Mongolia
- Raisebore stability and support at depth: Oyu Tolgoi case study J Ooi, Rio Tinto, Australia; LA Johnson AMC Consultants, Australia
- An assessment of numerical model inputs, results and the reality T Ormerod, OZ Minerals, Australia



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## Fifth International Conference on Block and Sublevel Caving

- Objectivity through minerology: application of hyperspectral data and machine learning for improved geotechnical characterisation of porphyries  
*S Otto, B Yang, E Tilley, WSP-Golder, Canada;*
- Managing seismic events through demarcation zones at a large block cave mine  
*R Paine, G James, IoT Automation Global Pty Ltd, Australia*
- Drawpoint spacing and recovery for high column block caves  
*P Paredes, Newcrest Mining Limited, Australia*
- Development of rock mass strength block models at Cadia East mine  
*M Pierce, Pierce Engineering, USA; C Thielsen, Itasca Consulting Group Inc., USA; C Orrego, D Tennant, Newcrest Mining Limited, Australia; J Furtney, Itasca Consulting Group Inc., USA; P Stonestreet, Newcrest Mining Limited, Australia; T Garza-Cruz, Itasca Consulting Group Inc., USA*
- Pillar collapse modelling, and mine design effect quantification through machine learning: a case study  
*R Quevedo, A Sari, S McKinnon, Queen's University, Canada*
- Preliminary results from tests using sublevel caving with 40 m sublevel height at Luossavaara-Kiirunavaara AB  
*C Quinteiro, A Nordqvist, Luossavaara-Kiirunavaara AB, Sweden*
- Rock mass modelling: lessons learned from years of application within the mining industry  
*JE Ramires, AngloGold Ashanti, Brazil; E Hamman, J Venter, K du Plooy, AngloGold Ashanti, Australia*
- Modelling of fracture initiation near a cave back and its implications for hydraulic fracturing concurrent to cave mining  
*R Rimmelin, BHP, Australia*
- Abutment loading in deep cave mines: understanding susceptibility to strainbursts  
*J Roy, WSP-Golder, Canada*
- Impact of the typical errors in geotechnical core description for the geomechanical design in large caving mines  
*A Russo, E Montiel, E Hormazabal, SRK Consulting, Chile*
- Managing the risk of uncontrolled flow of material (mudrush) at Argyle Diamond Mine  
*D Saepulloh, J Albrecht, Rio Tinto, Australia*
- Three-dimensional numerical modelling and analysis of complex stress variations and deformations at Malmberget mine, Sweden  
*D Saiang, Luleå University of Technology, Sweden; T Jones, Luossavaara-Kiirunavaara AB, Sweden*
- Preliminary assessment of mining options for Luossavaara-Kiirunavaara AB's Svappavaara orebodies, Sweden  
*D Saiang, M Sormunen, Luleå University of Technology, Sweden*
- A coupled continuous-discontinuous modelling approach for caving and subsidence at the Cadia East mine  
*B Sainsbury, Deakin University, Australia; D Sainsbury, Geotechnica Pty Ltd, Australia; A Osorio, D Carroll, J Lett, Newcrest Mining Limited, Australia*
- The planning of a cave rotation at the Ernest Henry sublevel cave mine  
*E Savage, Evolution Mining, Australia*
- Structural data to discrete fracture network modelling  
*D Sewnun, J Wesseloo, Australian Centre for Geomechanics, Australia*
- Unearthing the Black Rock orebody with sublevel caving  
*A Shiels, Glencore Copper, Australia*
- Evaluation of the relationship between active volume and seismic response in cave mining  
*S Silcock, SRK Consulting, UK*
- Analysis of caving and ground deformations in Malmberget using a coupled CAVESIM-FLAC3D model  
*J Sjöberg, Itasca Consultants AB, Sweden; L Jonsson, Luossavaara-Kiirunavaara AB, Sweden; M Sjölander, B Figueiredo, Itasca Consultants AB, Sweden; F Ersholm, Luossavaara-Kiirunavaara AB, Sweden*
- E48: a fine example of a successful block cave  
*L Snyman, S Webster, CMOC Mining Services Pty Ltd, Australia*
- A mixed-method approach for major excavation ground support evaluation  
*H Speakman, University of Exeter, UK*
- Longevity chart for planning the production and renovation of the orepasses  
*W Sredniawa, B Skawina, Luleå University of Technology, Sweden; G Shekhar, J Rapp, Luossavaara-Kiirunavaara AB, Sweden*
- Oyu Tolgoi: Engineering a Mongolian caving dynasty  
*CL Stegman, Rio Tinto, Australia*
- Controlled reopening of Kiirunavaara production block 22 after a 4.2 magnitude event  
*M Svartsjaern, T Rentzelos, Itasca Consultants AB, Sweden; G Shekhar, E Swedberg, M Boskovic, Luossavaara-Kiirunavaara AB, Sweden; Y Herbert, Itasca Australia Pty Ltd, Australia*
- Red Chris block cave project: overview  
*M Sykes, A Purba, Newcrest Mining Limited, Australia*
- Development of a wet muck spill susceptibility tool for short-term prediction through a logistic regression approach  
*J Varian, S McDougall, S Ghadiirani, The University of British Columbia, Canada; K Llewelyn, R Campbell, PT Freeport Indonesia, Indonesia; E Eberhardt, The University of British Columbia, Canada; A Moss, Sonal Mining Technology, Canada*
- Petroleum-based downhole geophysical methods for subsurface characterisation: a case study from Cadia East mine  
*K Galybin, Schlumberger, Australia; G Viegas Fernandes, Newcrest Mining Limited, Australia; D Lewis, Schlumberger; D Tennant, Newcrest Mining Limited, Australia*
- Geological and historically based numerical assessment of seismic hazard in an evolving block cave mine  
*G Viegas Fernandes, C Orrego, D Tennant, P Stonestreet, Newcrest Mining Limited, Australia*
- Multi-lift selection using scenario simulation and financial metrics  
*D Villa, Dassault Systèmes Canada Inc., Canada; J Romero, N Soto, Dassault Systèmes Chile, Chile*
- Implementation of a single pass self-drill and resin injection anchor system: Oyu Tolgoi case study  
*G Watt, Rio Tinto, Australia*
- Northparkes E22 deposit: a strategic re-evaluation of the mine design and material handling system  
*S Webster, CMOC Mining Services Pty Ltd, Australia*
- Observations of Northparkes cave edges, large surface failures and X-ray computer tomography to validate fracture banding failure mechanisms in caves  
*S Webster, L Snyman, CMOC Mining Services Pty Ltd, Australia; D Cumming-Potvin, Australian Centre for Geomechanics, Australia*
- A monitoring strategy to assess the effectiveness of pillar wrapping  
*Y Yanagimura, New Gold Inc., Canada; J Hadjigeorgiou, University of Toronto, Canada*
- Numerical modelling of fragmentation by blasting and gravity flow in sublevel cave mines  
*C Yi, Luleå University of Technology, Sweden*
- Rockburst management at Luossavaara-Kiirunavaara AB's Kiirunavaara mine: what can we learn from COVID-19 management  
*P Zhang, Luleå University of Technology, Sweden*