

# Deep Mining 2017

Proceedings of the Eighth International  
Conference on Deep and High Stress Mining

28–30 March 2017 | Perth, Western Australia

Volume Two: Design and application



EDITOR Johan Wesseloo

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## Proceedings of the Eighth International Conference on Deep and High Stress Mining

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Volume 2  
Design and application

*Editor*

**Johan Wesseloo**

Australian Centre for Geomechanics, Australia



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# Australian Centre for Geomechanics

The Australian Centre for Geomechanics was formally established in 1992 as a University of Western Australia research centre in order to promote research excellence and continuing education in geomechanics, with particular emphasis on its application to the mineral and energy extraction sections of Australia's resource industry.

The Australian Centre for Geomechanics is an unincorporated Joint Venture involving:

- CSIRO Earth Science and Resource Engineering
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The Centre draws together its staff knowledge and experiences with the expertise within the two groups forming the Centre and facilitates a multi-disciplinary approach to research and education in geomechanics. Research undertaken by the ACG attracts both national and global support and the outcomes of the projects are utilised to promote safer mining and environmental geomechanics practices, operating efficiencies and to meeting community expectations for sustainable mining practices.

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# Technical Reviewers

The dedicated efforts of the peer reviewers have resulted in the high quality of the technical programme and the papers compiled for this publication. The editor thanks the following people who contributed their time and expertise as reviewers of manuscripts for the proceedings of the Eighth International Conference on Deep and High Stress Mining held in Perth, Western Australia. A technical and critical review of each paper was undertaken by a minimum of two reviewers for the production of this volume.

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# Preface

The international conference series on Deep and High Stress Mining (Deep Mining) commenced in Perth in 2002, and was preceded with conferences in Johannesburg (2004), Quebec (2006), Perth (2007), Santiago (2010), Perth (2012), and Sudbury 2014.

The Eighth International Conference on Deep and High Stress Mining (Deep Mining 2017) is again welcoming mining personnel, researchers and consultants from around the world to Perth.

Humankind's hunger for resources is increasing the need to dig deeper into the Earth's crust to find new ore deposits as those located close to the surface are being mined out. Mineral reserves previously considered unmineable are now considered favourable. In Australia, the deepest mines are currently reaching operating depths of about 1,600 m. In Canada, depths of about 3,000 m are reached whilst in South Africa, operating levels are now nearing 4,000 m. Increasing mining depths create a unique set of challenges that need to be overcome to supply the world with the necessary commodities.

High stress conditions, however, are not limited to deep mining, and some mines experience problems commonly associated with deep mines at quite shallow depths. This is evidenced by several papers presented at previous Deep Mining conferences discussing stress induced problems at shallow depths, and even in quarries and open pit mines.

The rock mass' response to mining is complex and causes many challenges to deep mining operations. Some of these challenges appear in the form of seismicity and rockburst, where sudden and violent rock failure can put personnel and the mining operation at risk. Other rock masses experience squeezing ground conditions in which weak rock under high stress undergoes considerable deformation, to the extent that access is prevented. In these varying conditions, the design, installation and monitoring of appropriate and sufficient ground support systems is important.

Ground support technology, however, cannot be relied upon to negate the risks entirely. Geotechnical and financial risk assessment and management strategies form an integral part of the mining process and these strategies need to be improved as our knowledge and technology advances. Groundwater at depth also brings with it the challenge of dewatering and having to deal with highly corrosive environments where water may cause the deterioration of the ground support.

Since the beginning, the proceedings for the international conferences on Deep and High Stress Mining have provided an extremely valuable contribution to the state of the art literature on this important topic. Deep Mining 2017 continues this tradition and includes, among others, some valuable contributions to the design of ground support in dynamic and squeezing ground conditions, advances in numerical modelling approaches, seismic risk, geophysical methods to extract more information from seismic data, instrumentation, and geotechnical data management.

Thanks to the generous contribution of our open access sponsor SRK Consulting, for the first time, the conference proceedings are available online, free-of-charge. The papers can be accessed by scanning the QR code or from [papers.acg.uwa.edu.au/deepmining2017](http://papers.acg.uwa.edu.au/deepmining2017).

Johan Wesseloo  
Editor





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# Table of Contents

## VOLUME ONE: FUNDAMENTAL INVESTIGATION AND ANALYSIS

---

- iii Australian Centre for Geomechanics
- v Technical Reviewers
- ix Preface
- xi Conference Sponsors

## KEYNOTE ADDRESS

---

- 3 Shear ruptures of extreme dynamics in laboratory and natural conditions  
*BG Tarasov, The University of Western Australia, Australia*

## SEISMIC HAZARD/RISK

---

- 53 Seismic hazard at the Rosebery mine  
*C Knobben, MMG Limited, Australia*
- 61 Assessment and testing of seismic hazard for planned mining sequences  
*DA Malovichko, Institute of Mine Seismology, Australia*
- 79 Numerical investigation of the use of hydraulic stimulation to mitigate fault slip risk in deep mines  
*ES Schmidt, E Eberhardt, The University of British Columbia, Canada*
- 89 Large-magnitude seismicity at the Westwood mine, Quebec, Canada  
*KS Kalenchuk, Mine Design Engineering, Canada; R Mercer, Knight Piésold Ltd, Canada; E Williams, Iamgold, Canada*

## SEISMIC MONITORING AND ANALYSIS

---

- 105 A technique to determine systematic shifts in microseismic databases  
*IG Morkel, J Wesseloo, Australian Centre for Geomechanics and The University of Western Australia, Australia*
- 117 Comparison of data from complementary seismograph networks in a mining district  
*MRG Grobbelaar, D Birch, A Cichowicz, Council for Geoscience, South Africa*
- 125 Evolution of seismicity at Kiruna Mine  
*S Dineva, Luleå University of Technology, Sweden; M Boskovic, Luossavaara-Kiirunavaara Aktiebolag (LKAB), Sweden*
- 141 Application of subspace detection on a surface seismic network monitoring a deep silver mine  
*DJA Chambers, MS Boltz, JR Richardson, SA Finley, National Institute for Occupational Safety and Health, USA*

## SEISMIC RESPONSES AND RE-ENTRY ANALYSIS

---

- 157 The spatial and temporal assessment of clustered and time-dependent seismic responses to mining  
*K Woodward, J Wesseloo, Y Potvin, Australian Centre for Geomechanics and The University of Western Australia, Australia*
- 173 The implementation and quantification of the Vallejos and McKinnon re-entry methodology  
*IG Morkel, Australian Centre for Geomechanics and The University of Western Australia, Australia; P Rossi-Rivera, The University of Western Australia, Australia*
- 183 The optimisation and comparison of re-entry assessment methodologies for use in seismically active mines  
*SR Tierney, Curtin University, Australia; IG Morkel, Australian Centre for Geomechanics and The University of Western Australia, Australia*

## IN SITU STRESS DETERMINATION

---

- 199 Effective stress in rock  
*I Gray, Sigra Pty Ltd, Australia*
- 209 Estimation of in situ stress from borehole breakout for improved understanding of excavation overbreak in brittle-anisotropic rock  
*A LeRiche, Queen's University, Canada; KS Kalenchuk, Mine Design Engineering, Canada; MS Diederichs, Queen's University, Canada*
- 223 Borehole deformation under a stressed state and in situ stress measurement  
*CY Wang, ZQ Han, YT Wang, JC Wang, State Key Laboratory of Geomechanics and Geotechnical Engineering, Institute of Rock and Soil Mechanics, Chinese Academy of Sciences, China*
- 233 Inferring subtle stress changes related to blasting and large seismic events in mines using ambient noise  
*G Olivier, Institute of Mine Seismology, Australia*
- 247 Stress field characterisation in Nickel Rim South Mine using seismic stress inversion  
*Y Abolfazlzadeh, SD McKinnon, Queen's University, Canada*
- 257 Resolving sill pillar stress behaviour associated with blasts and rockbursts  
*LT Smith-Boughner, TI Urbancic, AM Baig, ESG Solutions, Canada*
- 269 Temporal changes in stress state imaged through seismic tomography  
*AM Baig, K Bosman, TI Urbancic, ESG Solutions, Canada*

## NUMERICAL MODELLING METHODOLOGY

---

- 277 Three-dimensional random Voronoi models for simulation of brittle rock damage around underground excavations in laminated ground  
*E Ghazvinian, KS Kalenchuk, Mine Design Engineering, Canada; MS Diederichs, Queen's University, Canada*
- 289 Computational fluid dynamic modelling of the Frood-Stobie ice stope thermal storage for mine ventilation heating  
*K Trapani, Mining Innovation, Rehabilitation and Applied Research Corporation (MIRARCO), Canada; Z Chen, Laurentian University, Canada*
- 299 Three-dimensional Voronoi-based distinct element model for simulation of hydraulic fracture propagation  
*E Ghazvinian, KS Kalenchuk, Mine Design Engineering, Canada*
- 311 Modelling hard rock jointed pillars using a distinct element and discrete fracture network approach considering the effect of a clay-filled shear structure  
*JJM Muaka, SRK Consulting (South Africa) (Pty) Ltd, South Africa; S Duma, P Mushangwe, Zimplats, Zimbabwe; L Gardner, Implats, South Africa; T Chindedza, J Walls, WC Joughin, SRK Consulting (South Africa) (Pty) Ltd, South Africa*
- 329 Three-dimensional inelastic numerical back-analysis of observed rock mass response to mining in an Indian mine under high-stress conditions  
*PK Rajmeny, Hindustan Zinc Ltd. (Vedanta), India; A Vakili, Mining One Consultants Pty Ltd, Australia*
- 343 Some issues in modelling of ground support using the three-dimensional distinct element method  
*N Bahrani, J Hadjigeorgiou, University of Toronto, Canada*
- 357 Deep sublevel cave mining and surface influence  
*J Sjöberg, F Perman, D Lope Álvarez, Itasca Consultants AB, Sweden; B-M Stöckel, K Mäkitaavola, Luossavaara-Kiirunavaara Aktiebolag (LKAB), Sweden; E Storvall, ÅF Infrastructure, Sweden (formerly Itasca Consultants AB, Sweden); T Lavoie, Itasca Consulting Group Inc., USA*
- 373 Numerical study of the relationship between seismic wave parameters and remotely triggered rockburst damage in hard rock tunnels  
*MJ Raffaldi, DJA Chambers, National Institute for Occupational Safety and Health, USA; JC Johnson, University of Utah, USA*
- 387 The improved unified constitutive model: a fine-tuned material model tailored for more challenging geotechnical conditions  
*A Vakili, Mining One Consultants Pty Ltd, Australia*

## FUNDAMENTAL INVESTIGATIONS INTO ROCK FAILURE

---

- 403 Mesocracking structures of the 'source type' in highly stressed rocks  
*VV Makarov, LS Ksendzenko, AM Golosov, NA Opanasiuk, Far Eastern Federal University, Russia*
- 413 Analysis of a potential coalburst phenomenon in different strata layers in underground coal mines  
*C Zhang, I Canbulat, F Tahmasebinia, O Vardar, S Saydam, University of New South Wales, Australia*
- 423 Zonal failure structure near the deep openings  
*VV Makarov, LS Ksendzenko, NA Opanasiuk, AM Golosov, Far Eastern Federal University, Russia*

## ROCKBURST AND LABORATORY INVESTIGATIONS

---

- 435 Experimental investigations into sacrificial support for containment of rockburst damage  
*A Mudau, TR Stacey, University of the Witwatersrand, South Africa; RA Govender, University of Cape Town, South Africa*
- 447 Influence of specimen dimensions on bursting behaviour of rocks under true triaxial loading condition  
*S Akdag, M Karakus, G Nguyen, A Taheri, The University of Adelaide, Australia*
- 459 Proceedings Author Index

# Table of Contents

## VOLUME TWO: DESIGN AND APPLICATION

---

iii	Australian Centre for Geomechanics
v	Technical Reviewers
ix	Preface
xi	Conference Sponsors

## KEYNOTE ADDRESSES

---

461	Data management and geotechnical models <i>ECF Hamman, DJ du Plooy, JM Seery, AngloGold Ashanti Australia Ltd, Australia</i>
489	Dealing with uncertainty and risk in the design of deep and high stress mining excavations <i>WC Joughin, SRK Consulting (South Africa) (Pty) Ltd, South Africa</i>

## ROCK MASS CHARACTERISATION

---

511	Strategic use of geotechnical data for maximised value added <i>CK Palleske, KS Kalenchuk, CD Hume, WF Bawden, Mine Design Engineering, Canada</i>
521	Automated, real-time geohazard assessment in deep underground mines <i>WJ McGaughey, V Laflèche, C Howlett, JL Sydor, D Campos, J Purchase, S Huynh, Mira Geoscience Ltd., Canada</i>
529	Investigation of fracture zone properties using reflected seismic waves from passive microseismicity <i>RA Lynch, Institute of Mine Seismology, Australia</i>
537	The use of soft computing methods for the prediction of rock properties based on measurement while drilling data <i>H Basarir, The University of Western Australia, Australia; J Wesseloo, Australian Centre for Geomechanics and The University of Western Australia, Australia; A Karrech, E Pasternak, A Dyskin, The University of Western Australia, Australia</i>

## OVERBREAK AND ROCKFALL

---

555	Geomechanical characteristics inferred from mine-scale rock mass behaviour <i>J Vatcher, Luleå University of Technology, Sweden; SD McKinnon, Queen's University, Canada; J Sjöberg, Itasca Consultants AB, Sweden</i>
569	Application of rock mass classification systems as a tool for rock mass strength determination <i>A Moser, H Wagner, S Schinagl, Montanuniversitaet Leoben, Austria</i>
587	Photogrammetry in underground mining ground control — Lucky Friday mine case study <i>DJ Benton, JB Seymour, MS Boltz, MJ Raffaldi, SA Finley, National Institute for Occupational Safety and Health, USA</i>
599	Integrating photogrammetry and discrete fracture network modelling for improved conditional simulation of underground wedge stability <i>SF Rogers, RP Bewick, Golder Associates Ltd., Canada; A Brzovic, Codelco, Chile; D Gaudreau, Golder Associates Pty Ltd, Australia</i>



## GROUND SUPPORT

---

- 613 Selecting an optimal ground support system for rockbursting conditions  
*V Louchnikov, MP Sandy, AMC Consultants Pty Ltd, Australia*
- 625 Empirical selection of ground support for dynamic conditions using charting of support performance at Hamlet mine  
*P Mikula, Mikula Geotechnics Pty Ltd, Australia; B Gebremedhin, Gold Fields Australia Pty Ltd, Australia*
- 637 Dynamic ground support — design methodologies and uncertainties  
*MJ Dunn, Evolution Mining, Australia*
- 651 The development of a ground support design strategy for deep mines subjected to dynamic-loading conditions  
*P Morissette, Agnico Eagle Mines Limited, Canada; J Hadjigeorgiou, University of Toronto, Canada*
- 667 Simulation of ground support performance in highly fractured and bulked rock masses with advanced 3DEC bolt model  
*L Bouzeran, J Furtney, Itasca Consulting Group Inc., USA; M Pierce, Pierce Engineering, USA; J Hazzard, JV Lemos, Itasca Consulting Group Inc., USA*
- 681 Ground control methods in squeezing and rockburst-prone ground in mining — case studies and benchmarking  
*RM Stephenson, MP Sandy, AMC Consultants Pty Ltd, Australia*
- 693 Design tools for squeezing ground conditions in hard rock mines  
*J Hadjigeorgiou, E Karampinos, University of Toronto, Canada*

## GROUND SUPPORT ELEMENT PERFORMANCE

---

- 709 The importance of the face plate as part of an engineered holistic ground support scheme in dynamic conditions  
*F Charette, Normet, Canada; A Bennett, Normet, Australia*
- 723 Role of chemical admixtures in improving wet-mix shotcrete performance for ground support  
*E Yurdakul, GCP Applied Technologies, USA; N Jackson, GCP Applied Technologies, Australia; KA Rieder, GCP Applied Technologies, USA*
- 733 Quasi-static and mechanical shock testing of reinforced shotcrete surface support  
*MJ Raffaldi, LA Martin, DJ Benton, CB Sunderman, MA Stepan, MJ Powers, National Institute for Occupational Safety and Health, USA*
- 747 In situ static performance assessment of mine mesh  
*RK Whiting, Independence Group, Australia*
- 763 Dynamic inflatable, friction rockbolt for deep mining  
*F Scolari, M Brandon, DSI Underground GmbH, Germany; H Krekula, Northern Mining Products AB, Sweden*
- 773 Ground support installations, using a mechanised unroller and flexible high-tensile strength chain link mesh  
*G Fischer, Geobruigg Andina SA, Chile; J Ruiz-Tagle, Salfa Montajes, Chile; R Bucher, Geobruigg Australia Pty Ltd, Australia; R Luis, Geobruigg AG, Switzerland*
- 785 Evaluation and mapping of corrosion in a western USA underground metal mine — year one preliminary results  
*AJ Chambers, CB Sunderman, DJ Benton, JT Brennan, National Institute for Occupational Safety and Health, USA; DT Orr, Hecla Mining Company, USA*

## GEOTECHNICAL DESIGN METHODOLOGY

---

- 801 The unanticipated performance of a weak massive rock mass at depth and the added value of observational engineering  
*KS Kalenchuk, CD Hume, Mine Design Engineering, Canada; F Morin, Fresnillo Plc., Mexico; WF Bawden, J Oke, CK Palleske, Mine Design Engineering, Canada*
- 813 Evaluation of ground management in underground excavation design  
*B Rahimi, M Sharifzadeh, Curtin University, Australia*
- 827 Importance of understanding laboratory strength and modulus testing data for deep mining in hard brittle rocks  
*RP Bewick, A Ouellet, Golder Associates Ltd., Canada; S Otto, Golder Associates Inc., USA; D Gaudreau, Golder Associates Pty Ltd, Australia*
- 843 Myths of deep and high stress mining — reality checks with case histories  
*FT Suorineni, University of New South Wales, Australia*

## GROUND CONTROL

---

- 863 Strengths and weaknesses of using elastic numerical modelling in mine design at the Callie underground mine  
*HF Arbi, K Doumis, N Dalton, Newmont Mining Corporation, Australia*
- 875 Advances in inflatable packer technology and application  
*CJ Rowe, FJ Ford, Inflatable Packers International Pty Ltd, Australia*
- 883 Elliptical shaft excavation and furnishing in response to depth induced ground pressure  
*GA Sturgis, DR Berberick, MP Board, WH Strickland, Hecla Limited, USA; MT Swanson, Cementation USA Inc., USA*

## MANAGING CHALLENGING CONDITIONS

---

- 901 Rock stresses, its controls and associated ground behaviour at the Rosebery mine, Tasmania  
*MF Lee, Monash University, Australia; R de Vries, CF Moller, MMG Limited, Australia*
- 917 Managing a change in rock mass response to mining at the Frog's Leg underground mine  
*J Mgumbwa, A Page, Evolution Mining, Australia; L Human, SRK Consulting (Australasia) Pty Ltd, Australia; MJ Dunn, Evolution Mining, Australia*
- 937 Managing the onset of accelerated deformation in capital development at Agnew Gold Mine  
*CR Moulding, Gold Fields Australia Pty Ltd, Australia; RM Stephenson, AMC Consultants Pty Ltd, Australia; BJ Barsanti, DD Francis, Gold Fields Australia Pty Ltd, Australia*
- 949 Underground environment parameter prediction in a deep mine  
*WS Lyu, SJ Cai, University of Science and Technology Beijing, China; P Yang, Beijing Union University, China; YL Zhang, University of Science and Technology Beijing, China*
- 961 Blast design for improved performance and reduced surface vibration – a case study  
*A Eremenko, Chinakal Institute of Mining of the Siberian Branch of the Russian Academy of Sciences, Russia*
- 975 Proceedings Author Index