

AFRIROCK

PIONEERING PROGRESS : 2025
THE FUTURE OF ROCK ENGINEERING

Venue: Sun City, Rustenburg, South Africa
21-23 JULY 2025 - Conference



Preliminary Programme

Sunday 20 July 2025

17:00-19:00 Welcome Networking Cocktail and Early Registrations
Venue: Warrior Room Foyer Area, Dress Code: Smart Casual

PLENARY SESSION

Conference Day 1—Monday 21 July 2025

07:30-08:30 Registration Opens & Early Morning Refreshments
08:30-08:40 Welcome and Opening Address
K.B. Le Bron, *Conference Chairperson, MLB Consulting, South Africa*
08:40-08:45 Safety Briefing
Venue Official
08:45-09:00 SAIMM Presidential Address
E. Matinde SAIMM President

Session Chair: S. Durapraj, *Sibanye-Stillwater, South Africa*
09:00-09:30 **Keynote Address: Practical considerations in the selection of ground support**
J. Hadjigeorgiou, *University of Toronto, Canada*
09:30-09:35 Sponsor Presentation - OHMS

PARALLEL SESSIONS

Ground Support

Session Chair: R. Hammah, *Rocscience, South Africa*

09:35-09:55 Rockbolts in shear
G. Knox, J. Hadjigeorgiou, *University of Toronto, Canada*
09:55-10:15 Hydro-powered resin bolting
J.P. Gouvea, W. Geel, *Glencore Northam Platinum Holdings Ltd, South Africa*
10:15-10:35 Controlling tailings backfill leakage through fractured pillars
G.M. Mphike¹, D. O'Connor¹, F. Sibanda², ¹Minova, ²South Deep Gold Mine, South Africa
10:35-10:55 The development of the fast cable anchor
J. Wang¹, B. Darlington¹, M. Farrington², P. Young¹, ¹Sandvik Mining & Rock Solutions ²Agnico Eagle, Australia
10:55-11:15 Mid-morning refreshments and networking

Geotechnical Data

Session Chair: G. Nkosi, *Siyanda Bakgatla Platinum Mine, South Africa*

09:35-09:55 Rectifying, conforming and extracting value from existing geotechnical data sets - the importance of good data management for optimal value extraction
M. van Aswegen¹, D.H. Mossop², ¹Independent Consultant - Data Governance, ²SRK Consulting, South Africa
09:55-10:15 Influence of saturation fluids on the elasto-plastic property of shale
L. Chen, L. Wang, *China University of Petroleum, China*
10:15-10:35 Unravelling the past for a safer future: How historic rock mass classification data compare with slope performance monitoring data
M. Pretorius, *Vedanta Resources, South Africa*

PLENARY SESSION

Session Chair: E. Pilane, *Vice President, Sibanye-Stillwater, South Africa*

11:15-11:20 Sponsor Presentation - Reutech Radar Systems
11:20-11:50 **Keynote Address: The implementation of hydraulic fracturing for pillar preconditioning in a deep gold mine**
D. Roberts, *Sibanye-Stillwater, South Africa*
11:50-11:55 Sponsor Presentation - Horts Mining
11:55-12:00 Sponsor Presentation - Sandvik

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Conference Day 1—Monday 21 July 2025 (continued)

PARALLEL SESSIONS

Ground Support (continued)

Session Chair: O. Mandingaisa, Valterra Platinum, South Africa

12:00–12:20 A review of the stope support system at Impala Bafokeng North Shaft owing to stope closure at shallow mining depths

T. Walsh, University of the Witwatersrand, South Africa

12:20–12:40 Method of pre-mining rib pillars and replacing these pillars using cemented aggregate fill

R.M. Arlow¹, I. Malpartida², J. Nyagumbo², ¹Dayenu, South Africa, ²Alphamin Resources, Congo

12:40–13:00 Performance and mechanical properties of a styrene-free polyester resin produced with water-based catalyst and a new generation catalyst

G. Smolnik, R. Penczek, J. Franek, D. Bucholc, Sandvik Ground Support, Poland

13:00–13:20 Blast-on-Mesh: Transforming deep-level gold mining – success stories from Kusasalethu

R. Van Heerden¹, M. Phathu², ¹Harmony Gold Mining Company, ²Geobrugg, South Africa (Online Presentation)

13:20–14:20 **Lunch**

14:20–14:40 Do underground excavations mined by non-explosive mining require less support than when mined by blasting? A challenge to rock engineers to review support design practice

R.G.B. Pickering, D. Arnold, J. Porter, South Africa

Slope stability

Session Chair: T. Dlokweni, Kumba Iron Ore, South Africa

12:00–12:20 Stabilisation of highwall instability using numerical modelling and statistical analysis for open pit mining

N. Umeh, N. Baloyi, S. Darries, T. Rangasamy, Middindi Consulting (Pty) Ltd, South Africa

12:20–12:40 Structural deformation characteristics of open-pit slopes under excavation disturbance

G. Ockhuizen¹, R. Armstrong², S. MacLennan³, ¹CGNPC Swakop Uranium, ²SRK Consulting, ³University of the Witwatersrand, South Africa

12:40–13:00 Rock fall hazard analysis of a natural slope at the Sungun Copper Mine

J.D. Bosman¹, L. Cilliers¹, H. Reza- Golchin², ¹Open House Management Solutions Pty Ltd, ²Sungun Copper Mine, South Africa

13:00–13:20 Mitigating pit floor instability above a confined aquifer: Assessing mining block dimensions and sequencing strategies

L. Bruyns, M. Rangasamy, T. Rangasamy, Middindi Consulting (Pty) Ltd, South Africa

14:20–14:40 Slope stability evaluation of gneiss rock slopes using SMR and QSlope

E. Kalhan, C. Kincal, Dokuz Eylul University, Turkey

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PARALLEL SESSIONS

Caving

Session Chair: E.J. Walls, AMC, South Africa

- 14:40–15:00 Assessing the role of stress distribution on mine layout design in Block Caving Mine
T. Mtshali¹, N.M. Chiloane², B. Makgate¹, T. Chauke²,
F.M. Mulenga², V.C. Madanda², T. Moyane¹,
R.B. Khumalo¹, ¹Palabora Mining Company,
²University of South Africa, South Africa
- 15:00–15:20 Application of flac3D to analyse the effects of mining induced stresses on the behaviour of drawpoint pillars: A case study of a long-hole open stoping mine in Zimbabwe
A. Velepini, Gwanda State University, Zimbabwe

Numerical Modelling

Session Chair: J. Hanekom, CSIR, South Africa

- 14:40–15:00 3D elastodynamic modelling applied in the design of technical blasts
L.M. Linzer^{1,2}, A.J. Rorke³, M.W. Hildyard⁴,
¹SRK Consulting, ²University of the Witwatersrand,
³Independent, South Africa, ⁴Leeds University, UK
- 15:00–15:20 Key block theory for the miner: A novel simplified method for determining block removability
C. van Rooyen, University of the Witwatersrand, South Africa
- 15:20–15:40 Application of large-scale finite element method simulations to determine geomechanical hazard during room-and-pillar mining under a tectonic fault
K. Fuławka¹, L. Stolecki¹, R. Kołodziej²,
¹KGHM CUPRUM Ltd, ²KGHM Polska Miedź S.A. - Mine, Lubin

15:40–16:00 Afternoon refreshments

16:00–17:30 Time at leisure

18:00–21:00 Network Cocktail function
Brew Monkey, Valley of the Waves, Dress Code: Smart Casual
(Sponsored by New Concept Mining)



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PLENARY SESSION

Conference Day 2—Tuesday 22 July 2025

07:30-08:30 Registration Opens & Early Morning Refreshments

08:30-08:40 Welcome and Opening Address
K.B. Le Bron, *Conference Chairperson,*
MLB Consulting, South Africa

08:40-08:45 Safety Briefing
Venue Official

Session Chair: M. Mothlageng, *CEO, Impala Rustenburg, South Africa*

08:45-09:15 **Keynote Address: Design of crush pillars and their use in high-stress mining**
B. Watson, *University of the Witwatersrand,*
South Africa

09:15-09:20 Sponsor Presentation - MLB Consulting 

Poster Session

09:20-09:25 Exploring the potential of distributed acoustic sensing for seismic and stress monitoring in underground mining
S. Dande¹, E. Forbes², T. Butler², A. Senso²,
ESG Solutions, South Africa

09:25-09:30 Determining the applicability of muon tomography for monitoring hazards in deep underground mines - a case study from a Polish Copper Mine
R. Kołodziej¹, K. Fuławka², L. Stolecki², G. Surányi^{3,5},
M. Holma^{3,4}, H. Gergő⁵, ¹KGHM Polska, ²KGHM CUPRUM
sp. z o.o., ³Muon Solutions Oy, Finland, ⁴Kerttu Saalasti
Institute, University of Oulu, ⁵Wigner Research Centre
for Physics, Budapest, Hungary

09:30-09:35 Advancing geotechnical risk management and seismicity mitigation through interactive guidelines and industry collaboration
H. Greeff, J. Hanekom, *Council for Scientific and Industrial Research, South Africa*

09:35-09:40 Geotechnical and Operational Risk Review for the Ultra-Long Ore Pass Arrangement at Venetia Underground Mine
E.J. Walls¹, F. Breed², M. Dlamini², T. Mokele,
¹AMC Consultants, ²De Beers, South Africa

09:40-09:45 Stabilisation of open pit wall movements detected by InSAR
P. Narshai¹, J. Pretorius¹, J. du Toit², ¹SkyGeo,
Netherlands, ²First Quantum Minerals, South Africa

09:45-09:50 HelloMac – Intelligent engineering revolutionising underground mine monitoring
W. Greyling, *MACCAFERRI, South Africa*

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Conference Day 2—Tuesday 22 July 2025 (continued)

PARALLEL SESSIONS

Seismicity

Session Chair: L. Scheepers, Sibanye-Stillwater, South Africa

09:50–10:10 Application of MEMS accelerometers for continuous near-wave monitoring of mining-induced seismicity, L. Stolecki, K. Fuławka, P. Mertuszka, KGHM CUPRUM Ltd, Poland

10:10–10:30 Underground fire tracking using live feed seismic response and consequent response during the cooling down period
M. Wiggins¹, L. Scheepers¹, J. Gerber²,
¹Sibanye-Stillwater, ²IMS – Institute of Mine Seismology, Stellenbosch, South Africa

Slope stability

Session Chair: G. Knox, Epiroc, South Africa

09:50–10:10 Stability design of slopes in carbonatite complexes characterised by brecciation
D. Moses¹, J.A. Onyango², ¹University of Malawi, Malawi, ²Jomo Kenyatta University of Agriculture and Technology, Kenya (Online Presentation)

10:10–10:30 Stability analysis and its prevention measures of rock slope blocks based on the coordinate projection method
B. Gao¹, J. Zhang¹, H. Zhang¹, Z. Yang², ¹Xi'an University of Science and Technology, ²Chinese Academy of Geology Sciences, China

Subsidence

Session Chair: L. Scheepers, Sibanye-Stillwater, South Africa

10:30–10:50 Modern satellite data provide new insights into surface movements above coal longwall mining
A. Vervoort, KU Leuven, Belgium

10:30–10:50 Risk-based slope design: Insights from the Thabazimbi failure
M. Bester¹, T. Dlokweni², I. Basson³, C. Koegelenberg³,
¹Anglo American, ²Anglo American, Kumba Iron Ore, ³Tect Geological Consulting, South Africa

10:50–11:10 Mid-morning refreshments and networking

PLENARY SESSION

Session Chair: O. Rakumakoe, Harmony Gold, South Africa

11:10–11:15 Sponsor Presentation - New Concept Mining  Powered by Epiroc

11:15–11:45 **Keynote Address: The art of rock engineering design and the need for research**
F. Malan, University of Pretoria, South Africa

11:45–11:50 Sponsor Presentation - Geobrugge Southern Africa 

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PARALLEL SESSIONS

Modern Analytical Techniques

Session Chair: R. Carstens, Anglo American, South Africa

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| 11:50–12:10 | Machine learning serving as a catalyst to enhance collaboration across generations and disciplines within the South African rock engineering context
R.T. Masethe ¹ , L. Msimango ² , ¹ University of KwaZulu-Natal, ² Gauteng Department of Education, South Africa |
| 12:10–12:30 | Transforming geotechnical data acquisition, 3D visualisation and analytics for modern mining
J. Meiring, P. Piper, Groundwork Consulting (Pty) Ltd, South Africa |
| 12:30–12:50 | Soft computing techniques for predicting mode-II fracture toughness: A cost-effective approach to advancing rock mechanics design and sustainability
N.O. Ogunsola ^{1,2} , F. Cawood ^{1,2} , H. Grobler ¹ , ¹ University of Johannesburg, ² Sibanye-Stillwater, South Africa |
| 12:50–13:10 | Comparison of machine learning classification for rockburst prediction: A case study of South African gold and platinum mines
N.P. Khumalo, R.T. Masethe, University of Kwazulu Natal, South Africa |
| 13:10–14:00 | Lunch |
| 14:00–14:20 | Towards ensuring sustainable mining: Application of a pareto-optimized hierarchical structural interaction matrix for prioritizing slope stability influencing factors
N.O. Ogunsola, O. Makinde, F. Cawood, H. Grobler, ¹ University of Johannesburg, South Africa |
| 14:20–14:40 | Role of machine learning in optimising prediction of blast fragmentation in mines using site-specific geological data
K.S. Makomborero, R.S. Suglo, M. Masialeti, Botswana International University of Science and Technology, Botswana |

Slope stability (continued)

Session Chair: R. Armstrong, SRK Consulting, South Africa

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| 11:50–12:10 | Calibratable rock mass shear strength for open pit slopes
J. Venter |
| 12:10–12:30 | Development of a filtered inverse velocity method analyser: A comparative study of smoothing filters in surface mines for optimisation of slope failure predictions
M.M. Masood, National Institute of Technology, India |
| 12:30–12:50 | Learnings from development of an underground sub-level open stope mine below an open pit
K.B. Le Bron ¹ , M.C. van Eeden ² , R. Vermeulen ² , ¹ MLB Consulting, Ballito, South Africa, ² Koidu Limited, Kono District, Sierra Leone |
| 12:50–13:10 | Guide to using gravity in the detection of underground voids
L.M. Linzer ^{1,2} , P. Linzer ¹ , ¹ SRK Consulting, ² University of the Witwatersrand, South Africa |

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Monitoring

Session Chair: L. Prinsloo, Valterra Platinum, South Africa

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|-------------|--|-------------|---|
| 14:40–14:45 | Sponsor Presentation - Timrite  | 16:55–18:00 | Time at leisure |
| 14:45–15:05 | The MDA CHORUS™ SAR constellation: A unique perspective for improved slope stability monitoring and geotechnical risk assessment
D. Hickson ¹ , R. Morin ¹ , R. Podmore ² , ¹ MDA Space, ² Leica Geosystems, ¹ Canada, ² South Africa | 18:00–18:15 | Transfer to the Shebeen venue from main conference centre |
| 15:05–15:25 | Afternoon refreshments | 18:30–22:00 | Conference Dinner, Shebeen
Dress Code: Smart Casual |
| 15:25–15:30 | Sponsor Presentation - Rocscience Inc.  ROCSCIENCE | 22:00–22:15 | Transfer back to main conference venue |
| 15:30–15:35 | Sponsor Presentation - Strocam Mining Bedrock  | | |
| 15:35–15:55 | Klipgat boxcut long-term stability assessment and monitoring
S. Vezî ¹ , R.T. Masethe ² , ¹ African Rainbow Minerals ² University of Kwazulu Natal, South Africa | | |
| 15:55–16:15 | Compact radar system for rockmass movement monitoring in underground narrow reef stope
D. van Rooyen ¹ , R. Carstens ¹ , L. Campbell ² , ¹ Anglo American, South Africa, ² Geobotica, Australia | | |
| 16:15–16:35 | Monitoring mining-induced subsidence and sinkholes using multi-band InSAR: A case study from Lubambe copper mine
P. Chipola ¹ , R. Sililo ¹ , A. Mkandla ² , M. Douglas ³ , M. Spreafico ³ , ¹ Lubambe Copper Mine, Zambia, ² TRE Altamira, South Africa, ³ TRE Altamira, Italy | | |
| 16:35–16:55 | Closure and accelerometer measurements to enhance mine safety
L. Scheepers ¹ , P. Lenegan ¹ , F. Pienaar ² , H. Hoogenboezem ³ , ¹ Sibanye Gold, ² Mining Product Developments, ³ Hoogenboezem Industries, South Africa | | |

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Conference Day 3—Wednesday 23 July 2025

07:30-08:30	Registration Opens & Early Morning Refreshments	08:45-09:15	Keynote Address: Rockburst risk management in deep hard rock mines – A multi tiered approach with dynamic ground support as the last line of defence B. Simser
08:30-08:40	Welcome and Opening Address K.B. Le Bron, <i>Conference Chairperson, MLB Consulting, South Africa</i>	09:15-09:20	Sponsor Presentation - Maccaferri MACCAFERRI
08:40-08:45	Safety Briefing Venue Official		

Underground Rock Mechanics

Session Chair: G. Kotze, *OHMS, South Africa*

09:20-09:40	Optimal stoping limits and ground stability analysis for 202 N S1 raise line at Doornkop shaft M. Mudau ¹ , D. Mhlanga ¹ , T. Gcuda ² , R.T. Masethe ³ , ¹ Harmony Gold Mine, ² University of the Witwatersrand, ³ University of Kwazulu Natal, South Africa
09:40-09:45	Sponsor presentation - M&J Mining 
09:45-10:05	Mid-morning refreshments
10:05-10:10	Sponsor presentation - MSP Mine Support Products 
10:10-10:40	Keynote Address-Finding signal in a noisy world during a Fourth Turning F. Basson, <i>Newmont Corporation</i>
10:40-11:00	Pillar assessment at Bindura Nickel Corporation Trojan Mine in Zimbabwe F. Kwangwari, W.C. Joughin, <i>SRK Consulting, South Africa</i>
11:00-11:20	Geotechnical design of coal bord and pillar panels: some complementary suggestions A. Vervoort, <i>KU Leuven, Belgium</i>
11:20-11:40	Back analysis of ore pass design at Big Gossan sub level open stope mine, Indonesia A. Sjadat ¹ , J.P.E. Hamman ¹ , Y. Irab ¹ , I. Haque ² , ¹ PT Freeport Indonesia, Indonesia, ² Freeport-McMoRan Inc., USA
11:40-11:45	Sponsor presentation - Leica Geosystems 
11:45-12:45	Lunch
12:45-12:50	Sponsor presentation - Dwyka Mining Services 

Session Chair: S. Durapraj, *Sibanye-Stillwater, South Africa*

12:50-13:10	Seismological and numerical characterisation of stability pillar behaviour at South Deep Mine S.M. Sibanda, B.P. Watson, <i>University of the Witwatersrand, South Africa</i>
13:10-13:30	Prediction of mine tunnel conditions in a deep Austrian mine by means of numerical back- and forward analysis P. Gams ¹ , B. Moosbacher ² , H. Wagner ¹ , T. Fruehwirt, ¹ Montanuniversität Leoben, ² RHI Magnesita, Austria
13:30-13:50	Development of a multi-stage large excavation crusher chamber at Palabora Mining Company M. Matsapola ¹ , R.B. Khumalo ¹ , V.C. Madanda ² , F.K. Mulenga ² , ¹ Palabora Mining Company, ² University of South Africa, South Africa
13:50-14:10	Effect of pyroxenite layers on the strength of UG2 pillars T.J. Maphosa, B.P. Watson, <i>University of the Witwatersrand, South Africa</i>
14:10-14:30	Improvements in stope designs, and sequencing at the Big Gossan sub level open stope mine, Indonesia A. Febrian, A. Sjadat, J.P.E. Hamman, <i>PT Freeport Indonesia, Indonesia</i>
14:30	Conference close