DEEP MINING

ACG AUSTRALIAN CENTRE FOR GEOMECHANICS

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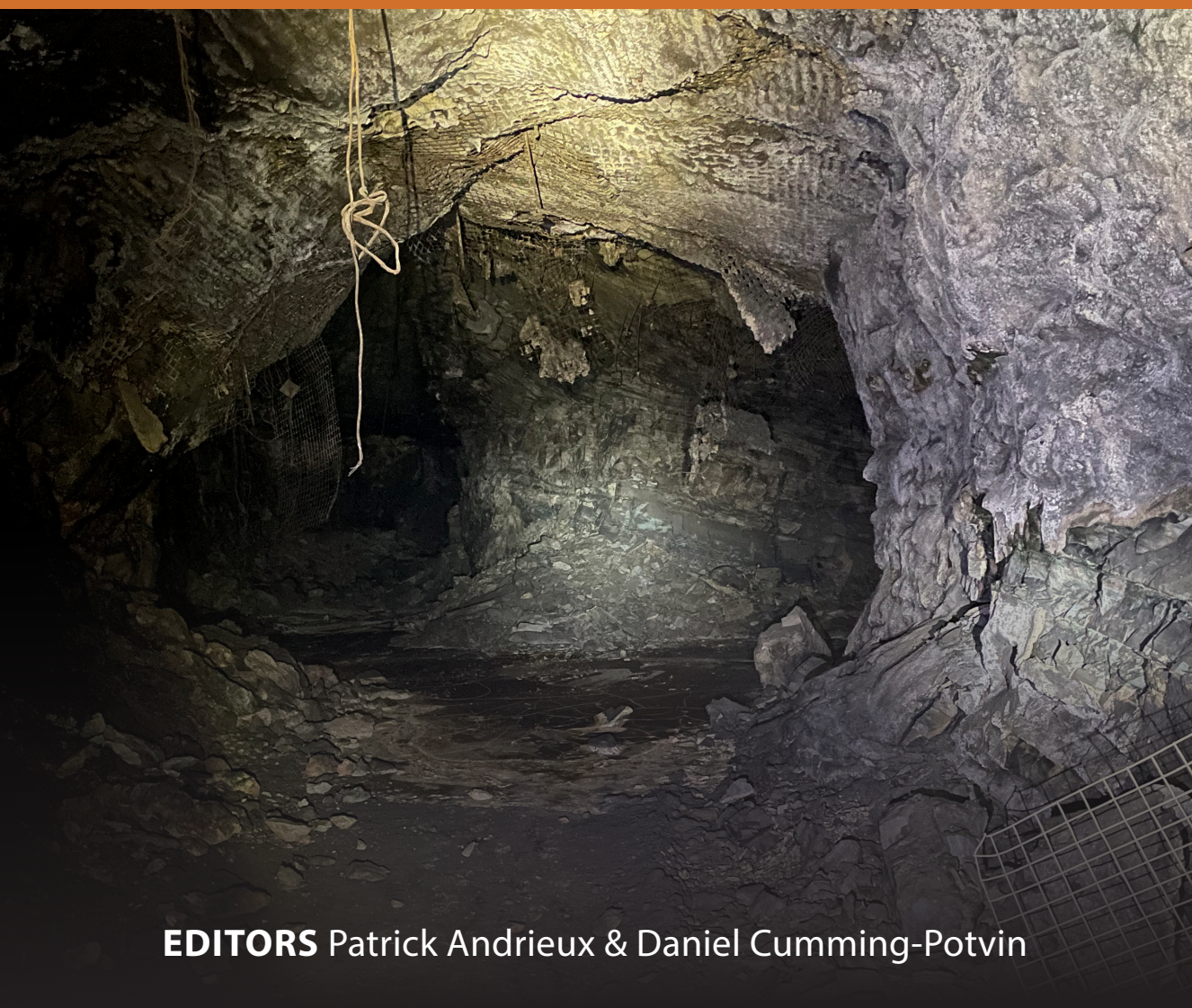
# Deep Mining 2024

## Proceedings of the 10th International Conference on Deep and High Stress Mining

24–26 September 2024 | Montreal, Canada

**Volume One**



**EDITORS** Patrick Andrieux & Daniel Cumming-Potvin

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Front cover, back cover, and section page photos courtesy of A2GC, Canada.

Production team: Garth Doig, Chloe Grimshaw, Candice McLennan, Christine Neskudla, Josephine Ruddle, and Stefania Woodward, Australian Centre for Geomechanics.

ISBN 978-0-6450938-9-6
ISSN 2208-8172


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# Australian Centre for Geomechanics

The Australian Centre for Geomechanics (ACG) was formally established in 1992 as a University of Western Australia not-for-profit 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 resources industry.

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

- CSIRO Mineral Resources
- The University of Western Australia — Civil, Environmental and Mining Engineering

The ACG draws together staff knowledge, experiences and expertise from 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.

With the guidance of strong industry representation on the Board of Management, and close collaboration with senior representatives of the mining industry, research, training and further education activities are tailored directly to the needs of industry. The ACG Board expects the Australian Centre for Geomechanics to be the focal point for industry on geomechanics issues and to address the needs of industry through a collaborative interdisciplinary approach.

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*Accessing geomechanical excellence*

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With the recent addition of the Deep Mining 2024 papers, 321 Deep Mining conference papers are now freely available. Setting a high standard for technology transfer and accessibility, this valuable online resource will continue to develop and grow with future conferences.

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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), Sudbury (2014), Perth (2017), and Cape Town (2019).

The organisers of the 10th International Conference on Deep and High Stress Mining (Deep Mining 2024) are excited to welcome attendees interested in deep mining from around the world for our first conference held in Montreal, Canada.

As shallow ore deposits around the world are increasingly depleted, the worldwide mining industry is increasingly having to push the boundaries of viable mining depths, with mines now operating below 4,000 m. Recent investment in green technologies is likely to further fuel the need for minerals, increasing the production needed to meet the world's demand.

Many issues faced by deep mines are driven by stress and in many mining jurisdictions, stress and seismicity can become serious problems at relatively shallower depths, with many Australian mines experiencing challenges well before depths of 1,000 m.

The challenges faced by these deep and high-stress mines are numerous and significant. They vary from squeezing ground conditions; when underground excavations close up due to mining-induced stress, to rockbursting; where underground personnel and equipment are put at risk due to the extreme brittle failure of the rock mass around excavations. Management of water and the corrosion associated with it, along with ventilation of hot underground conditions, are further considerations that need to be addressed by mines operating under challenging conditions.

Mitigation strategies for these problems often include monitoring the response of the rock mass (to better understand the problem), installing specialised ground support (to try to tackle the rock mass response to mining), together with implementing planning strategies to minimise negative impacts on production.

The Deep Mining conference series has always been a showcase for the exciting new work that has gone into managing these challenges, including analysis of seismic data, numerical modelling, design of ground support, creation of new technologies for monitoring the rock mass, and development of risk-management strategies. Deep Mining 2024 is no exception, with a large volume of high-quality papers across a range of topics applicable to deep and high-stress mining. Given that the nature of these problems is among the most challenging in the mining industry, it is likely that the learnings will be valuable for a broad spectrum of mines and mining professionals.

The Deep Mining 2024 proceedings can be found online, free of charge at the ACG Online Repository. They can be accessed using the following QR code or from papers.acg.uwa.edu.au/deepmining2024.

Dr Patrick Andrieux and Dr Daniel Cumming-Potvin
Deep Mining 2024 Conference Co-editors and Conference Co-chairs

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## Numerical modelling