Workshop on **Physics-Based Forecasting of Seismic Response to Mining**

Convened by Dmitriy Malovichko (Institute of Mine Seismology)

The conventional assessment of seismic hazard for tectonic earthquakes typically relies on statistical data analysis, assuming that geological forces and influencing factors evolve slowly, and that future seismicity will mirror past patterns. However, these approaches have limited applicability to seismicity induced by mining. Mining activity often exhibit significant temporal and spatial variability, necessitating the development of physics-based approaches to hazard forecasting that account for changes in the forces driving induced seismicity.

3D geomechanical models incorporating heterogeneous rock mass properties, complex evolving networks of underground excavations, and strain-softening constitutive relations have gained widespread use in mining operations. These models enable the prediction of inelastic rock mass deformations associated with planned mining activities, including their dynamic component (seismic events). Forecasting seismic response to mining, translating it into hazard assessments, and selecting relevant mitigating actions are becoming standard practice in rockburst-prone mines.

The aim of this workshop is to share experiences related to various aspects of physics-based forecasting of seismicity and associated hazards: geomechanical modeling of seismic rock mass response to mining, model calibration through comparisons of forecasts with observations or adjustments via data assimilation, types of hazards (e.g., damage due to strong ground motion vs. violent deformation within seismic sources), and adopting forecasts in management and preventative actions (e.g., traffic light systems, hazard reduction, or mitigation strategies).

Programme:

13h00 | Welcome and Introduction
Dmitriy Malovichko, Institute of Mine Seismology, Australia

13h15 | Simulating the governing physics of seismicity in numerical models
David Beck, Beck Engineering, Australia

13h40 | Some perspectives on modeling and integration of seismicity and geomechanics
Doug Angus, ESG Solutions, Canada

14h05 | Limits of numerical modeling in seismic and rockburst hazard forecasting: Efficiency, bias, and misuse in mining applications
David Cuello, GMT, Australia and Chile

14h30 | Rethinking mine seismicity: Insights from modern rock mechanics
Abou Vakili, Mining One, Australia

——— Coffee/tea break ———

15h15 | Numerical modelling for seismic hazard forecast in deep excavations
Neda Dadashzadeh, RockEng, Canada

15h40 | Forecasting mine seismicity with inelastic continuum models
Cyrille Séguineau de Préval, A2GC, Canada

16h05 | Mine-scale simulation of slip- and crush-type seismic events using inelastic modeling
Alex Rigby Institute of Mine Seismology, Australia

16h30 | Calibration of rockmass failure criteria for modelling of seismic response to mining
Dmitriy Malovichko, Institute of Mine Seismology, Australia

16h55 | Discussion