Caving 2014 – Final Technical Program

Thursday, June 05

Plenary Session
Sala AB - **Session Chair: Dr. Raúl Castro, Caving 2014 Co-Chairman**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session Title</th>
<th>Presenter/Institution</th>
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<tbody>
<tr>
<td>8.30</td>
<td>Welcome</td>
<td>Dr. Raúl Castro, Caving 2014 Co-Chairman, Chile</td>
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<tr>
<td>8.40</td>
<td><strong>Future Challenges and Why Cave Mining Must Change</strong></td>
<td>Dr. Germán Flores, Newcrest Mining, Australia</td>
</tr>
<tr>
<td>9.10</td>
<td><strong>The Role of Collaborative Research in Addressing Future Cave Mining Challenges</strong></td>
<td>Dr. Gideon Chitombo, The University of Queensland</td>
</tr>
<tr>
<td>9.40</td>
<td><strong>Coffee Break</strong></td>
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</tr>
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</table>
### Preconditioning and Fragmentation
Sala A – Session Chair: Dr. Andrés Brzovic, Codelco, Chile

<table>
<thead>
<tr>
<th>Time</th>
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<tbody>
<tr>
<td>10.00</td>
<td>Study of the impact of rock mass preconditioning on a block caving mine operation</td>
<td>Claudio Castro, Instituto de Minería y Metalurgia IM2, Chile</td>
</tr>
<tr>
<td>10.20</td>
<td>Pre-conditioning with hydraulic fracturing – when and how much?</td>
<td>Cristobal Valderrama, Pontificia Universidad Católica, Chile</td>
</tr>
<tr>
<td>10.40</td>
<td>Numerical analysis of pre-conditioning using blasting and its relationship with the geomechanical properties of the rock mass and its interaction with Hydraulic fracturing</td>
<td>Iván Piñeyro, Instituto de Minería y Metalurgia IM2, Chile</td>
</tr>
<tr>
<td>11.00</td>
<td>Intensity rock mass preconditioning and fragmentation performance at the El Teniente Mine, Chile</td>
<td>Andrés Brzovic, CODELCO, Chile</td>
</tr>
<tr>
<td>11.20</td>
<td>Caving propagation and dilution control through the pre-conditioning technology</td>
<td>Victor Barrera, IM2, Chile</td>
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<tr>
<td>11.40</td>
<td>An alternative approach to verifying predicted fragmentation in weak rock</td>
<td>R Greenwood, SRK, Canada</td>
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### Lunch

### Cave Mechanics
Sala B – Session Chair: Dr. Yves Potvin, ACG, Australia

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<tbody>
<tr>
<td>10:00</td>
<td>Assessment of broken ore density variations in a block cave draw column as a function of fragment size distributions and fines migration</td>
<td>Leonardo Dorador, University of British Columbia, Canada</td>
</tr>
<tr>
<td>10.20</td>
<td>Assessing the state of the rock mass in operating block caving mines: A review</td>
<td>Daniel Cumming-Potvin, University of Western Australia, Australia</td>
</tr>
<tr>
<td>10.40</td>
<td>Influence of secondary fragmentation and column height on block size distribution and fines migration reaching drawpoints</td>
<td>Leonardo Dorador, University of British Columbia, Canada</td>
</tr>
<tr>
<td>11.00</td>
<td>Analysis of hanging frequency in Block-1 Esmeralda Mine</td>
<td>Eduardo Viera, CODELCO, Chile</td>
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<tr>
<td>11.20</td>
<td>Geomechanical ground control in block/panel caving</td>
<td>Jaime Díaz, DERK, Chile</td>
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<tr>
<td>11.40</td>
<td>ALCODER, challenges of paradigms in caving methods</td>
<td>Guillermo Krstulovic, Geomecánica Ltda., Chile</td>
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</table>

### Lunch
## Mine Planning

### Sala A - Session Chair: Dr. Tony Diering, Geovia, Canada

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<tbody>
<tr>
<td>13.30</td>
<td>Mine sequence optimization for Block Caving using concept of ‘best and worst case’</td>
<td>Daniel Villa, Geovia, Canada</td>
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<tr>
<td>13.50</td>
<td>Fast track in detail engineering for Panel Caving</td>
<td>Julio Vienne, AMEC, Chile</td>
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<td>14.10</td>
<td>Optimizing Hill of Value for Block Caving</td>
<td>Alfonso Ovalle, AMEC, Chile</td>
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<td>14.30</td>
<td>Footprint and economic envelope calculation for Block/Panel Caving Mines under geological uncertainty</td>
<td>Emilio Vargas, Universidad de Chile, Chile</td>
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<tr>
<td>14.50</td>
<td>Determination of the best height of draw in block cave sequence optimization</td>
<td>Firouz Khodayari, Universido de Alberta, Canada</td>
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<td>15.10</td>
<td>Coffee Break</td>
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## Caving Mechanics and Geomechanical Design

### Sala B - Session Chair: Eduardo Rojas, Codelco, Chile

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<tr>
<td>13.30</td>
<td>Characterization and synthetic simulations to determine rock mass behaviour at the El Teniente Mine, Chile. Part 1</td>
<td>Andrés Brzovic, Codelco, Chile</td>
</tr>
<tr>
<td>13.50</td>
<td>Characterization and synthetic simulations to determine rock mass behaviour at the El Teniente Mine, Chile. Part 2</td>
<td>Javier Vallejos, Universidad de Chile, Chile</td>
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<tr>
<td>14.10</td>
<td>Geomechanical issues and concepts associated with scoping study and prefeasibility stage of a Block/Panel Caving Project</td>
<td>Jaime Díaz, DERK, Chile</td>
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<tr>
<td>14.30</td>
<td>Management indicators for the cave geometry control, El Teniente Mine</td>
<td>Javier Cornejo, Codelco, Chile</td>
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<td>14.50</td>
<td>Fragmentation estimates using BCF software - experiences and pitfalls</td>
<td>Jarek Jakubec, SRK, Chile</td>
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### Mine Planning and Innovation

**Session Chair: Dr. Eleonora Widzyk-Capehart, AMTC, Chile**

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<tr>
<td>15.40</td>
<td>Block caving strategic mine planning using risk-return portfolio optimization</td>
<td>Enrique Rubio, REDCO, Chile</td>
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<tr>
<td>16.00</td>
<td>Hybrid composite, a way to enhance the mechanical properties of breakable ground support</td>
<td>Victor Barrera, IM2, Chile</td>
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<td>16.20</td>
<td>Pilot tests as a tool for the design of autonomous mining Systems</td>
<td>José Riquelme, Universidad de Chile, Chile</td>
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<td>16.40</td>
<td>Semiautonomous Mining Model</td>
<td>Miguel Fishwick, IM2, Chile</td>
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<td>17.00</td>
<td>Future automated mine operation: Synergistic collaboration between humans and automated systems</td>
<td>Javier Ruiz del Solar, EE Dept., University of Chile, AMTC, Chile</td>
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<td>17.20</td>
<td>Implementation of LIDAR technology to evaluate deformation field induced by panel caving exploitation</td>
<td>Alejandro Espinosa, CODELCO, Chile</td>
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<td>17.40</td>
<td>Automation of underground mining operations and it’s effects on mine design</td>
<td>Francisco Rodriguez, CODELCO, Chile</td>
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<td>19.00</td>
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### Geomechanical Design and Geomechanical Characterization

**Session Chair: Ernesto Arancibia, Codelco, Chile**

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<tr>
<td>15.40</td>
<td>Considerations for designing a geomechanics monitoring plan for each engineering stage</td>
<td>Alejandro Espinosa, CODELCO, Chile</td>
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<tr>
<td>16.00</td>
<td>Integrated support quality system at El Teniente Mine</td>
<td>María Soledad Célis, CODELCO, Chile</td>
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<tr>
<td>16.20</td>
<td>Ciresata geotechnical evaluation and caving study, Romania</td>
<td>Nat Burgio, Stratavision, Australia</td>
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<td>16.40</td>
<td>Geostatistical evaluation of fracture frequency and crushing</td>
<td>Serge Antoine Seguret, Paris Tech, France</td>
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<tr>
<td>11.20</td>
<td>A 3DEC-FLAC3D Model to Predict Primary Fragmentation Distribution in Cave Mines</td>
<td>Tryana Garza-Cruz, Itasca, United States</td>
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<tr>
<td>17.20</td>
<td>Identification of different geomechanics zones in panel caving- application to Reservas Norte El Teniente</td>
<td>Juan Alegria, CODELCO, Chile</td>
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<td>17.40</td>
<td>Robotic Hang-up Assessment and Removal</td>
<td>Greg Baiden, Penguin Automated Systems Inc., Canada</td>
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<td>19.00</td>
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**Friday, June 06**

**Plenary Session**  
Sala AB - **Session Chair: Fidel Báez, Codelco, Chile**

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<td>Fidel Báez, Caving 2014 Co-Chairman, Chile</td>
</tr>
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<td>8.40</td>
<td>Supercaves: The Productivity and Management Challenges</td>
<td>Octavio Araneda, CODELCO, Chile</td>
</tr>
<tr>
<td>9.10</td>
<td>It’s Not Mine Safety But Mind Safety - A Henderson Approach</td>
<td>Gordon Carlson, Henderson Mine, United States</td>
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<tr>
<td>9.40</td>
<td>Coffee Break</td>
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## Gravity Flow

**Sala A - Session Chair: Dr. Matt Pierce, Itasca, USA**

<table>
<thead>
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<th>Time</th>
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<tr>
<td>10.00</td>
<td><strong>Use of experiments to quantify flow-ability of caved rock for block caving</strong></td>
<td>René Gómez, Universidad de Chile, Chile</td>
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<tr>
<td>10.20</td>
<td><strong>An analysis of the lateral dilution entry mechanisms in Panel Caving</strong></td>
<td>Pablo Paredes, Universidad de Chile, Chile</td>
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<tr>
<td>10.40</td>
<td><strong>Application of a methodology for secondary fragmentation prediction in cave mines</strong></td>
<td>Miguel Fuenzalida, Itasca, United States</td>
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<tr>
<td>11.00</td>
<td><strong>Case Study: Improving SLC recovery by measuring ore flow with electronic markers</strong></td>
<td>Simon Steffen, Elexon, Australia</td>
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<tr>
<td>11.20</td>
<td><strong>Real-time tracking of ore flow: development of the Cave Tracker System</strong></td>
<td>David Whitemann, Elexon, Australia</td>
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<tr>
<td>11.40</td>
<td><strong>Stochastic Model for gravity flow: Numerical consideration</strong></td>
<td>William Gibson, SRK, Australia</td>
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<tr>
<td>12.00</td>
<td>Lunch</td>
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## Case Studies

**Sala B - Session Chair: Dr. Germán Flores, Newcrest, Australia**

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<tr>
<td>10.00</td>
<td><strong>Draw control strategy at the New Gold New Afton Mine</strong></td>
<td>Ahsan Chaudhary, New Gold, Canada</td>
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<td>11.00</td>
<td><strong>New growth strategy in Esmeralda Mine</strong></td>
<td>Nicolás Jamett, CODELCO, Chile</td>
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<tr>
<td>10.20</td>
<td><strong>Caving experiences in Esmeralda Sector, El Teniente Mine</strong></td>
<td>Makarina Orellana, CODELCO, Chile</td>
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<tr>
<td>10.40</td>
<td><strong>Undercut management at the North 3rd Panel, Rio Blanco Mine, Andina Division, Codelco Chile</strong></td>
<td>Luis Quiñones, CODELCO, Chile</td>
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<tr>
<td>11.20</td>
<td><strong>Ground Support in Weak Rock Mass — Learning from Cassiar Cave Mine</strong></td>
<td>Jarek Jakubec, SRK, Australia</td>
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<tr>
<td>11.40</td>
<td><strong>Fracturing in the footwall at the Kiirunavaara mine, Sweden</strong></td>
<td>Mikael Nilsson, Luleå University of technology, Sweden</td>
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### Gravity Flow and Mine Planning

**Sala A - Session Chair: Jarek Jakubec, SRK, Canada**

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<td>13.30</td>
<td>Experimental study of fines migration for caving mines</td>
<td>Francisco Armijo, BCTec, Chile</td>
</tr>
<tr>
<td>13.50</td>
<td>First steps in monitoring gravity flow at the El Teniente mine: installation stage in Block-2, Esmeralda mine</td>
<td>Eduardo Viera, CODELCO, Chile</td>
</tr>
<tr>
<td>14.10</td>
<td>Statistical analyses of mud at Diablo Regimento sector of the El Teniente Mine</td>
<td>Isaac Navia, Universidad de Chile, Chile</td>
</tr>
<tr>
<td>14.30</td>
<td>Chuquicamata Underground Project subsidence analysis</td>
<td>Augusto Aguayo, CODELCO, Chile</td>
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<tr>
<td>14.50</td>
<td>How tall a column in Block Caving?</td>
<td>C. Cerrutti, AMEC, Chile</td>
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<td>Coffee Break</td>
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### Future Projects and Unit Mining Operations

**Sala B - Session Chair: Hans Göpfert, AMEC, Chile**

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<td>13.30</td>
<td>Block Caving using Macro Blocks</td>
<td>Fernando Villegas, CODELCO, Chile</td>
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<td>13.50</td>
<td>La Encantada: An inclined cave design</td>
<td>Juan Valencia, NCL, Chile</td>
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<td>14.10</td>
<td>Methodology for up-hole drilling accuracy measurements at Kiruna SLC mine</td>
<td>Matthias Wimmer, LKAB, Sweden</td>
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<td>14.30</td>
<td>Analysis of geometric design in ventilation raises for Block Cave production level drifts</td>
<td>Juan Pablo Hurtado, Universidad de Santiago de Chile, Chile</td>
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<td>14.50</td>
<td>Methodology for the design of blasting drawbell in a single shot</td>
<td>Álvaro Altamirano, BCTec, Chile</td>
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<td>Coffee Break</td>
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### Subsidence and Numerical Models
# Sala A - Session Chair: Dr. Michel Van Sint Jan, MVA Geoconsulta, Chile

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<tr>
<td>15.40</td>
<td>Transition open pit underground</td>
<td>Carlos Valenzuela, Claropa, Chile</td>
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<td>16.00</td>
<td>Design of 3D models in mining</td>
<td>Eduardo Córdova, CODELCO, Chile</td>
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<td>16.20</td>
<td>Numerical modelling of Pilar Norte Mine development using Abaqus</td>
<td>Michel Van Sint Jan, CODELCO, Chile</td>
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<td>16.40</td>
<td>Geomechanical evaluation of large excavations at the new level mine - El Teniente</td>
<td>Esteban Hormazábal, SRK, Chile</td>
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<td>17.00</td>
<td>Towards an understanding of mud rush behaviour in block-panel caving mines</td>
<td>María Elena Valencia, Universidad de Chile, Chile</td>
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<td>17.20</td>
<td>Application of InSAR technologies to measure the subsidence at El Teniente’s Mine</td>
<td>Alejandro Espinosa, CODELCO, Chile</td>
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## Unit Mine Operations and Seismicity

Sala B - Session Chair: Dr. Juan Pablo Hurtado, USACH, Chile

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<tr>
<td>15.40</td>
<td>Simulating the logistic of an underground mine</td>
<td>Marcelo Moretti, Paragon, Chile</td>
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<tr>
<td>16.00</td>
<td>Analysis of induced damage due to undercut blasting</td>
<td>Danko Morales, HATCH, Chile</td>
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<td>16.20</td>
<td>Seismic risk management for underground miningprojects - Codelco Chile División El Teniente</td>
<td>Alejandro Espinosa, CODELCO, Chile</td>
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<tr>
<td>16.40</td>
<td>Seismic hazard analysis at the El Teniente mine using a clustering approach</td>
<td>Javier Cornejo, CODELCO, Chile</td>
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<tr>
<td>17.00</td>
<td>Modeling induced seismicity in 4D</td>
<td>Eduardo Córdova, CODELCO, Chile</td>
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<td>17.20</td>
<td>Improved microseismic event hypocenter locations in Block Caving Mines using the double difference tomography</td>
<td>Jean-Philippe Mercier, Golder, Chile</td>
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