Mira Geoscience
...modelling the earth

eNewsletter Q4-2016

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Don't miss out!

Here is a quick glance at our Upcoming Events Calendar:

- **November 28-December 2** Mira Geoscience Workshop Series in Perth, Australia
- **November 28-30** Saskatchewan Geological Open House in Saskatoon, Canada
- **January 23-26** Mineral Exploration RoundUp 2017 in Vancouver, Canada
- **March 5-8** PDAC2017 Convention in Toronto, Canada
- **March 26** Data integration strategy for deep mining hazard assessment - Workshop in Perth, Australia
- **March 28-30** Deep Mining 2017 in Perth, Australia

…more details on our Upcoming Events page

Welcome to the 2016, Q4 eNewsletter. In this edition, we report on our new Sudbury office, our work with 3D analysis of hyperspectral core scanning data as well as some customized geohazard assessment software we are working on for a client based in Russia. We present our new R&D project on predictive analytics. We look back on this year's edition of Earth Modelling Forum. On the software side, we talk about the release of version 2.30 of Geoscience ANALYST, version 15.5 of GOCAD Mining Suite and version 3.1 of VPem1D. We present people who have recently joined our team and, finally, provide details on available job openings, tips of the month, and upcoming events and workshops.

We opened a new office in Sudbury!

Last August, we opened a new office in Sudbury, Ontario, Canada. With a growing business in northern Ontario, Mira Geoscience's third Canadian office will support both local and internationally-based clients.

In June, the Centre for Excellence in Mining Innovation (CEMI) celebrated the successful conclusion of the SUMIT program with a final meeting in Sudbury. SUMIT was a major multi-sponsor, multi-university research program created "to develop and advance smart engineering methods, technologies and tools to facilitate step-change advances in underground mining at depth." High-level summaries of the program's achievements, including our own participation through the creation of a comprehensive data management system to support underground mining research and operations, were presented to all project stakeholders. During the same meeting, CEMI announced the launch of the new Mining Observatory Data Control Centre (MODCC), a long-term collaboration with SNOLAB through which the massive data management and data-analytics capabilities of a world-class physics laboratory will be brought to the world of mining (see article on page 4). MODCC, situated in the SNOLAB building adjacent to Vale's Creighton Mine, is the location of our new office!

Courtesy of CEMI

June's celebrations of SUMIT program

(continued)

New team members!

In Australia:

Andrew Banks Earlier this year we welcomed Andrew to our Brisbane based team. Andrew is a senior consultant who leads geological exploration, interpretation, modelling and resource projects with particular expertise in coal. He has significant experience in the mining industry with operating mines and development projects. He has worked on major projects in the UK, Africa, SE Asia and Australia. Before his current role, he was Principal Geologist for Rio Tinto Coal Australia and Resource Geologist with BHPB Coal in Queensland. Andrew obtained a BSc Honours in geology from the University of Port Elizabeth, South Africa, and is currently studying towards an MBA at Bond University.

In Canada:

Our Montreal software development team is growing with the addition of software developers **Bona Tan, Simon Huynh, Vahe Hakobyan** and **Julien Sawyer**. With backgrounds in Software Engineering, Computer Science and Physics, and diverse experience, they bring a wide gamut of expertise to our team. We also recently welcomed **Jack Geddes**, who joined us as a Technical Writer.

Our Vancouver office welcomed **Kristofer Davis**. Kristofer is a Scientific Programmer who completed his Ph.D. in Geophysics at the Colorado School of Mines. As a Post-Doc at UBC he worked on several advanced problems in geophysical inversion, focusing, amongst other research areas, on development of software workflows to support constrained geophysical inversion. His experience and academic profile provide an ideal background to continue development of our VPmg and VPem1D products as well as our other geophysical tools and workflows.

"Our business continues to grow at a good pace", said John McGaughey, CEO/CTO, of Mira Geoscience. "With our offices in Montreal, Vancouver and now Sudbury along with those in Australia, we can provide unrivalled products and services to our global clients from key mining regions. The new office reflects our commitment to provide unparalleled technology advancements in data management, modelling and analysis solutions to a strategically important region. We have ambitious growth targets for our business, and with the addition of this office we will be able to better serve our customers in the northern heart of Canada's mining industry".

We welcomed **Frank Santaguida** as a Senior Consultant in our Sudbury office.

Frank joined our team in August to work directly with customers throughout northern Ontario and Quebec. Frank brings extensive exploration, mining, and research experience, specializing in geochemistry, stratigraphic reconstruction, hydrothermal alteration mapping, and interpreting metal enrichment patterns of base and precious metal ore deposit districts around the world. Prior to his current role, he was a Principal Geologist at First Quantum Minerals Limited. Frank obtained his PhD in Earth Sciences from Carleton University. Frank is based in our new Sudbury office.

Snowlab

Working with hyperspectral data on core in 3D Characterization of CU-porphyry

Last February, with the help of Corescan Pty Ltd., we experimented with modelling hyperspectral core scan data in 3D. We wanted to see for ourselves the upside of 3D interpretation and visualization of alteration and geometallurgical domains that are determined from hyperspectral analysis.

Hyperspectral core scanning provides repeatable, quantitative measurements of mineral abundance on drill core and cuttings. Its reliability complements direct observation by geologists and can provide higher accuracy. The intent of our effort was to facilitate 3D interpretation by creating, modelling, and visualizing hyperspectral interpretation products to link geological concepts across different scales. We also wanted to integrate hyperspectral core scan data with other geoscience data sets and models in 3D.

Hyperspectral core scan data provides ~200,000 data points per metre of core. Such high data density is not necessary for the creation of the first draft of a 3D model, but can be useful in later stage interpretation. The hyperspectral data were down-sampled and imported with the 3D location of the abundances of a wide range of mineral types. Bringing such data into a 3D environment enables powerful opportunities for exploratory data analysis. It enables direct comparison of alteration mineral abundance with 3D fault network geometry, lithology models, and 3D geophysical inversion models. Using hyperspectral mineral abundance data to cross-validate a 3D geological model provides a better understanding of mineral deposits to support sound business decisions, including drillhole targeting.

(continued)

Job opportunities!

Join our Canadian team:

Product Development Manager

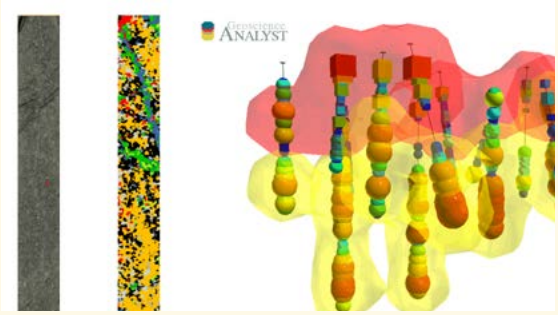
We have an opportunity for a Product Development Manager to join our Montreal team. Working closely with internal clients and the software development team, the Product Development Manager bridges the gap between client requirements and software development. The Product Development Manager ensures that high-level business requirements are converted into software requirements by managing features, tasks and milestones. This is a role where you are regularly interacting with the developers, establishing deliverables, time-lines and managing milestones while considering resources, technology, stakeholders, scope and budget. This position requires a mining or geotechnical background and a working knowledge of mining industry data management.

Communication Coordinator

We have an immediate opportunity for a Communications graduate to join our Montreal team for an initial 18-month contract. The communication coordinator will work closely with internal stakeholders to coordinate our external communication initiatives, as well as coordinating logistics for industry and company events, tradeshows, conferences and meetings. The deliverables will include creating and editing content on digital and print platforms, managing print material, maintaining regular content updates on our web site, social media and traditional media, monitoring new content reach and impact via available tools (Google analytics, etc.), assisting with the development of marketing material, brochures and presentations, and managing the quarterly publication and distribution of our newsletter.

If you're interested in finding out more let us know »

Corescan is a global services company specializing in automated mineralogical and textural analysis of drill core, rock chips and other geological samples for mining, oil and gas, geothermal and geotechnical applications.



From core, to data, to 3D space: Deposit-scale alteration domains for a Cu-porphyry deposit derived from 3D modelling of hyperspectral corescan mineral abundance data. Alunite (in red) and montmorillonite (in yellow) mineral abundances and the drillholes show alunite (cubes) and montmorillonite (spheres). Warm colours and large size means high abundance; cool colours and small size means low abundance.

Geoscience INTEGRATOR for real-time geotechnical hazard forecast JSC Apatit mines, Russia

Mira Geoscience has entered into a partnership with DMT GmbH & Co KG to customize and install a 4D data management and reporting system for geohazard assessment of rockbursts and rock falls at JSC Apatit's Kirovski and Rasvumchorrski phosphate mines in Russia.

Only a proper data management framework that handles the entire range of both static and dynamic data enables accurate modelling and analysis of the geotechnical hazard problem at the mine site. This is because the underlying data are time-dependent and results of analysis must be routinely updated.

The system we are customizing for JSC Apatit will allow for continuous data import and integration, automatically triggering recalculation of the hazard indices as the input data change. The geological model and 3D mine modelling are accomplished with GOCAD Mining Suite. Spatial hazard calculations are carried out directly in the Geoscience INTEGRATOR data management system. Reports are automatically directed to the mine complex's Rockburst Forecast and Prevention Centre and other stakeholders via email. 3D visualization is carried out with Geoscience ANALYST. Decision makers will have all necessary information at their fingertips to analyze the situation, mitigating rockburst risk and production disruption at the Kirovski and Rasvumchorrski mines.

More details on Geoscience INTEGRATOR available here »

DMT GmbH & Co KG: With currently 30 offices around the world, DMT is a global corporate group of 14 engineering and consulting firms, providing interdisciplinary services in the four markets Mining, Oil & Gas, Civil Engineering & Infrastructure and Plant Engineering.

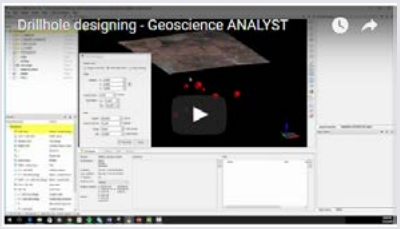
Example of a rockburst event aftermath in a drift.

Geoscience ANALYST:

November's tip

Introduction to the Drillhole Designer module

This video is meant to be an introductory training tutorial on the capabilities and features of the Drillhole Designer. We will show you three drillhole designing methods: from target to surface, collar down and from an existing drillhole.



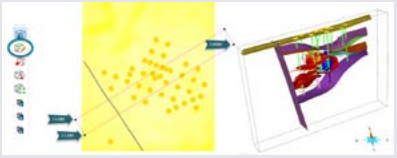
To receive our tips or to view previous ones, visit our site. »

GOCAD® Mining Suite:

November's tip

Version 15.5 - new functionality

In addition to the new features and functionality outlined in the release notes, there is a new slicer tool from Paradigm. The Digitize Slicer tool rotates the camera to a top view to let you digitize a square to define the boundaries of the slicer.



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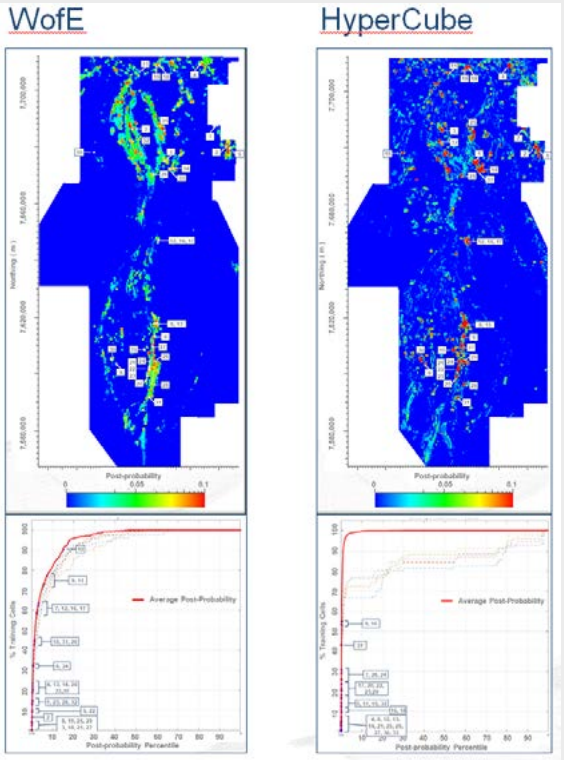
What's new!

R&D project with CEMI and SNOLAB

Predictive Analytics: Adding value from exploration to mine to mill



© Department of Natural Resources and Mines, Queensland

Case studies we previously considered demonstrated that predictive analytics presents more focus results (i.e., proceptivity map).

We are thrilled to have participated in the creation of MODCC, a collaboration of CEMI and SNOLAB, through the project *Predictive Analytics: Adding Value from Exploration to Mine to Mill*.

The objective was to create a mining industry-leading data management and machine learning facility, making use of resources and experience from the particle physics community, whose SNOLAB facility is at Vale's Creighton deep underground mine. We firmly believe this collaboration will lead to better interpretation of mineral exploration and mining data in support of better business decisions with profound economic value.

Interpretation of mining and mineral exploration data has not yet taken advantage of the major recent advances in machine learning approaches to predictive analytics. Machine learning is the current subject of a vast amount of global research in computational science, now used ubiquitously throughout financial services, social networks, physical sciences, and other applications. It permits understanding of complex relationships amongst a multitude of disparate variables that are impossible to discern with conventional statistical approaches. Mineral exploration targeting, delineation drillhole optimization, geotechnical hazard assessment in deep mines, geometallurgy, mineral processing, mine production and maintenance scheduling, and mine-to-mill operational optimization are all domains ripe for the application of predictive analytics. MODCC will be a key player and we are proud to be included in its vision for improving exploration and mining business outcomes.

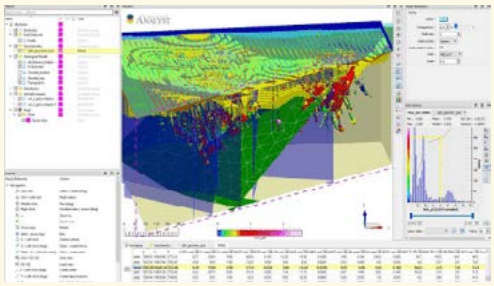
More about MODCC: "*The MODCC will represent a powerful user- and data-interpretation interface that searches, collects, filters and analyzes mining/exploration related datasets. The result will be a data processing facility with accessibility and capability unlike anything currently available to mining/exploration companies and researchers anywhere in the world.*" – MODCC Program Summary

Software development news:

Released - Geoscience ANALYST version 2.30

Version 2.30 of Geoscience ANALYST is now available. It includes new features, enhancements and fixes to existing features. This version also introduces a series of add-on modules that enable useful data analysis and provide interpretation tools and utilities: Geoscience ANALYST Pro offers object and data editing and creation functionality. ioGAS Link (requires Pro) dynamically links to ioGAS v6.2. Drillhole Designer (requires Pro) offers a user-friendly environment to quickly design new drillholes.

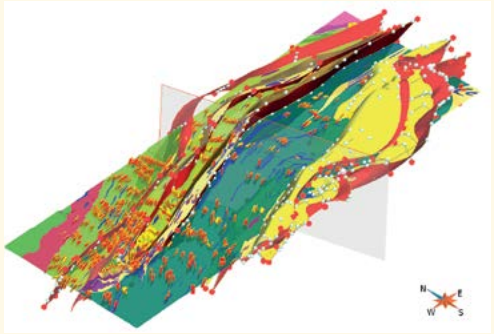
Details about the add-on modules available here »



Released – GOCAD Mining Suite version 15.5

Version 15.5 of GOCAD Mining Suite is now available. This release introduces some new tools, as well as updates to functionality such as: New ASCII file importer; Improved ASCII drillhole importer; Create multi-dimensional (array) properties; Classifies ioGAS v6.2 imports as Lithogeochemistry; Supports VPmg 8.1 for Total Magnetic Gradient (Analytic Signal) inversion and Remanent Magnetization Inversion; Supports VPem1D v3.1 and UBC-GIF v5.0. This will definitely improve your modelling experience.

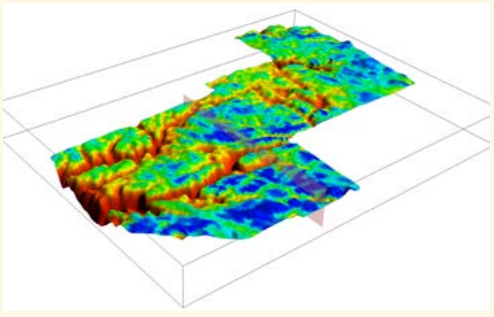
Details about the product available here »



Released - VPem1D version 3.1

Version 3.1 of VPem1D is now available. It provides users with multi-core processing options for geometry and heterogeneous conductivity inversion, providing a substantial improvement in speed. VPem1D v3.1 includes improvements to log files and on-screen display (e.g., reporting cumulative misfit as the inversion proceeds), additional QA/QC on input files (e.g., parameter file and the transmitter waveform file), a modified inversion algorithm to avoid premature stalling and a first release of built-in functionality to automatically resample the transmitter waveform.

More information about VP Suite available here »



Events and workshops:

Mira Geoscience Workshop Series

Perth, Australia – November 28-December 2, 2017

Mira Geoscience is excited to provide five days of training and workshops on 3D integration and modelling of geological, geophysical and geochemical data for mineral exploration, including training courses on GOCAD Mining Suite and Geoscience ANALYST. Attendees can go to any number of the sessions. The theme of these workshops and training courses is to showcase the process of integrating geological, geophysical and geochemical data for better interpretation and modelling with a constant focus on mineral exploration objectives. We will review the principles of a common-sense integration framework with selected case study examples, breakout sessions and training on some of the 3D modelling techniques

Register now, places are limited »

Data integration strategies for deep mining hazard assessment - Workshop

Perth, Australia – March 26, 2017

In conjunction with the upcoming Eighth International Conference on Deep and High Stress Mining in Perth in March 2017, we are hosting a practical one-day workshop introducing concepts, methods, and applications of data integration in geotechnical hazard assessment. Operators know that hazards such as rock bursts and falls of ground are influenced by seismicity, stress, deformation, structures, rock mass condition, mine geometry, ground support, production, and other factors. This workshop will review practical methods of integrating all relevant hazard criteria into a comprehensive, quantitative estimation of hazard probability on the mine.

The workshop outcome will be an appreciation of the value and methods of quantitative data management and integration in identifying sets of conditions associated with geotechnical hazard incidents, including the relative importance of seismicity and other inputs. Details about the program available on our website.

Register now, places are limited »

Looking back on Earth Modelling Forum 2016

Last month we hosted a full program on technology advancements in earth modelling and data integration. If you missed it, or want to reminisce, here is a quick glance at what happened.

Once again we brought together some of the greatest people and technology involved in multi-disciplinary earth modelling. It was four days of knowledge sharing with a positive, friendly vibe. The forum focused on technology advancements in data integration, modelling and analysis solutions for the mining industry. Industry experts discussed best practices through oral presentations, workshops and training classes. The program included great keynote addresses, case studies, technical presentations, training courses and workshops, social events and networking.

This event provided an exceptional opportunity to exchange knowledge and perspectives on 3D earth modelling technology, methods, and business value. Several sessions were devoted to technology innovation, in which participants got to watch, learn, and interact.

Complete program with abstracts and presentations available here. »