

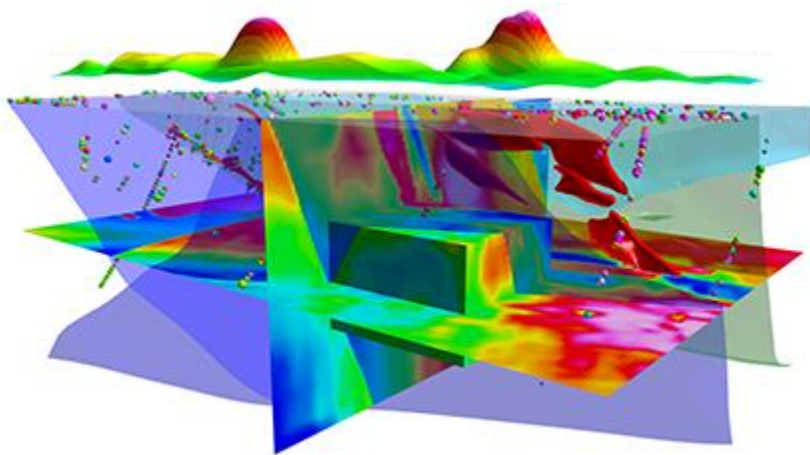


Mira Geoscience
...modelling the earth

GOCAD® Mining Suite Packages

GOCAD Mining Suite is the industry-leading platform for 3D integrated modelling of geological, geophysical, geochemical, structural, and geotechnical data. It specializes in the modelling of challenging environments within the realms of exploration, resource assessment, mine sites, and geotechnical modelling. It is the leader in 3D geological and structural modelling; excelling where drillhole control is minimal or non-existent, as well as in geologically-based 3D geophysical modelling and inversion, complex stratigraphic and fault modelling, geotechnical rock mass modelling and hazard assessment.

Use *all* of your data, *all* of the time



GOCAD Mining Suite is configured into packages specific to the minerals exploration and mining industry. The packages are designed to suit the specific requirements of geologists, geochemists, geophysicists, structural geologists, and geotechnical engineers. They are designed for integrated 3D model-building across all commodity types and geological environments, leveraging the core ability to import, create, and integrate objects of all types in a single environment. It is a true 3D GIS, where both vector objects (points, curves, and surfaces) and raster objects (grids/voxets) can be built, imported, edited, queried, and visualized. This Common Earth Modelling platform allows technicians, geoscientists, engineers, and managers to develop, share, and collaborate on data, information, and models regardless of their respective discipline.

"I've had a chance to use SKUA (Implicit Modelling) on an active project and compare the results with conventional modelling. Generally, I've found most software looks good in the packaging and produces rather underwhelming results – SKUA was completely the opposite, I'm completely gobsmacked with how well it created an extensive, realistic regional model with a few scraps of a priori information."

*-Adam Woolridge, Director
– Xpotential Geoscientific Consulting*

We have a package configured for your needs:

Role	Geoscience Exploration Package	Advanced Interpretation Package	Geotechnical Modelling Package	Integrated Modelling Package	Advanced Geophysics Package	Stratigraphic Modelling Package
Technician	✓					
GIS Technician	✓					
Geomodeller	✓	✓				
Geochemist		✓		✓		
Geologist	✓	✓				✓
Geophysicist					✓	✓
Structural Geologist		✓		✓		✓
Resource Geologist		✓		✓		✓
Geological Engineer			✓			
Geotechnical Engineer			✓			

Geoscience Exploration Package

Users: Geomodellers, GIS Technicians, Geologists

Packaged for those seeking to work in a true 3D GIS environment, building regional, project or deposit scale 3D models. This includes compiling and integrating historical data and regular updating of models with new information from disparate multidisciplinary sources, including drilling, outcrop measurement, surface sampling, physical properties, lithology, geochemistry, assays, structural measurements, and geophysics.

GOCAD 3D Mining Viewer + Foundation Modelling Module

- *Provides the basic viewing camera, selection, querying, interrogating, and navigation of a project and data in 3D space.*
- *Provides visual digitizing and querying of all types of objects in 3D space.*

Multi-Core Support for Foundation Modelling Module

- *Faster processing for voxets and the use of all computer cores to support heavy voxel operations.*

Maps, Cross-Sections, and Well Section Module

- *Maps: Fast, professional, and flexible layouts and style templates.*
- *Cross sections: Includes grid extraction and deviated well tracks (facies, log, image, etc.), solid filling according to rock classifications and markers, print to scale with annotations, 3D fence sections, drillhole pillars for vertical holes, link to 3D camera, style templates.*
- *Well-sections, section from well collars, well tracks and overlay, style templates.*

Mining Utilities Module

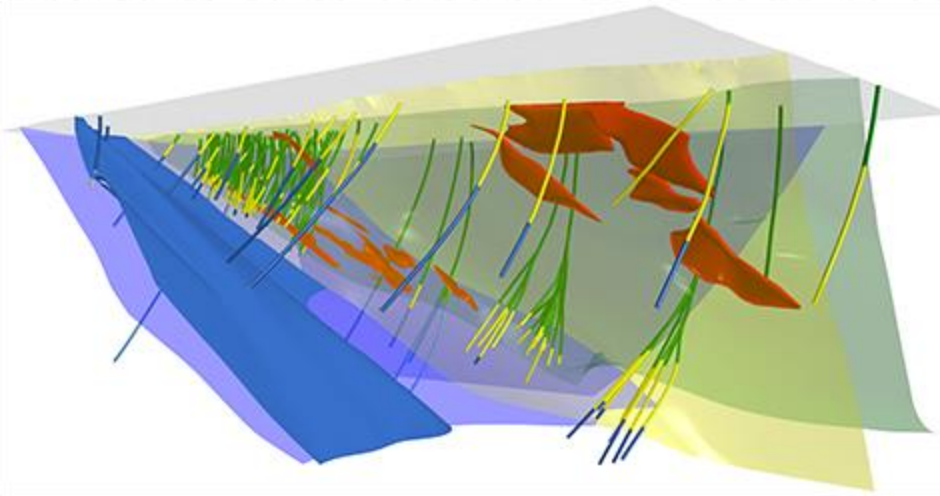
- *Extensive import/export filters.*
- *Mining-specific applications and functions e.g. drillhole designer.*

3D-GIS Module

- *Visualize, interpret, and query geometry and properties on drillhole logs including discrete and continuous properties.*
- *Nested and Boolean operations.*
- *Metadata editor.*
- *Tabular information display interactive with 3D visualization.*

Advanced Interpretation Package

Users: Geologists, Structural Geologists, Geochemists, Advanced Geomodellers



Focuses on multi-disciplinary construction, visualization, querying, and interpretation of integrated 3D data and models. It includes the full capability of the Geoscience Exploration Package plus the ability to digitize and edit 2D cross-sections, multi-parameter interrogation of block models, and geostatistical interpolation, estimation, and simulation. Adding the optional ioGAS-GOCAD Mining Suite Link presents the ideal configuration for querying, interrogating, and visualizing geochemical and alteration signatures in 3D.

GOCAD 3D Mining Viewer + Foundation Modelling Module

Multi-Core Support for Foundation Modelling Module

Maps, Cross-Sections, and Log Display Module

Mining Utilities Module

3D-GIS Module

+

Well Correlation and Stratigraphic Analysis Module

- *Digitizing/editing on cross-sections, strip logs, and maps synchronized with features; flattening at drillhole markers.*
- *Automated drillhole correlation using the stratigraphic column.*
- *Drillhole log ghosting, editing, and zone manipulation.*
- *Export drillhole logs to CSV.*

Interpretation Modelling Module

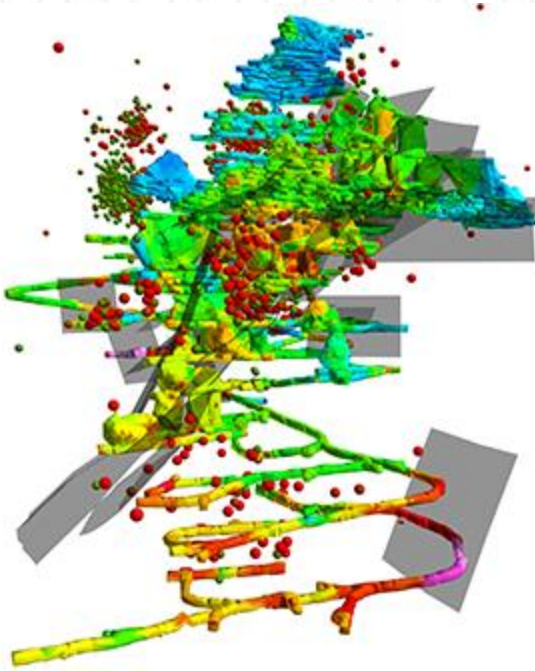
- *Advanced block model visualization.*
- *Voxel interrogation probe via 3D box, property co-rendering (up to three at a time), real-time slicer, fence cross-section, arbitrary user-defined axis.*
- *User-defined restricted view of open data (points, lines, surfaces, volumes etc.) in 3D camera window rendered to probe surface; includes 3-property co-rendering.*
- *Seismic data, full interpretation workflow with auto-picking and tracking in 2D/3D, cross-sections (maps) from probes.*

Velocity Modelling and Time-to-Depth Conversion Module

- *Kriging estimation engine for geostatistical estimation and simulation on 2D/3D grids and triangulated surfaces.*
- *Works in concert with variogram analyser e.g. auto-fitting, coordinates transform.*
- *Deformed grid geostatistics - a better way to unfold data properly.*

Geotechnical Modelling Package

Users: Geotechnical Engineers, Geological Engineers, Ground Control Engineers



Integrates disparate data sources into a single integrated 3D model in active mining applications for geotechnical modelling and hazard identification. Includes the full capability of the Advanced Interpretation Package plus specific functionality for complex querying, targeting, and 3D identification of geotechnical hazards.

GOCAD 3D Mining Viewer + Foundation Modelling Module
Multi-Core Support for Foundation Modelling Module
Maps, Cross-Sections, and Log Display Module
Mining Utilities Module
3D-GIS Module
Well Correlation and Stratigraphic Analysis Module
Interpretation Modelling Module
Velocity Modelling and Time-to-Depth Conversion Module
+
Geotech Module

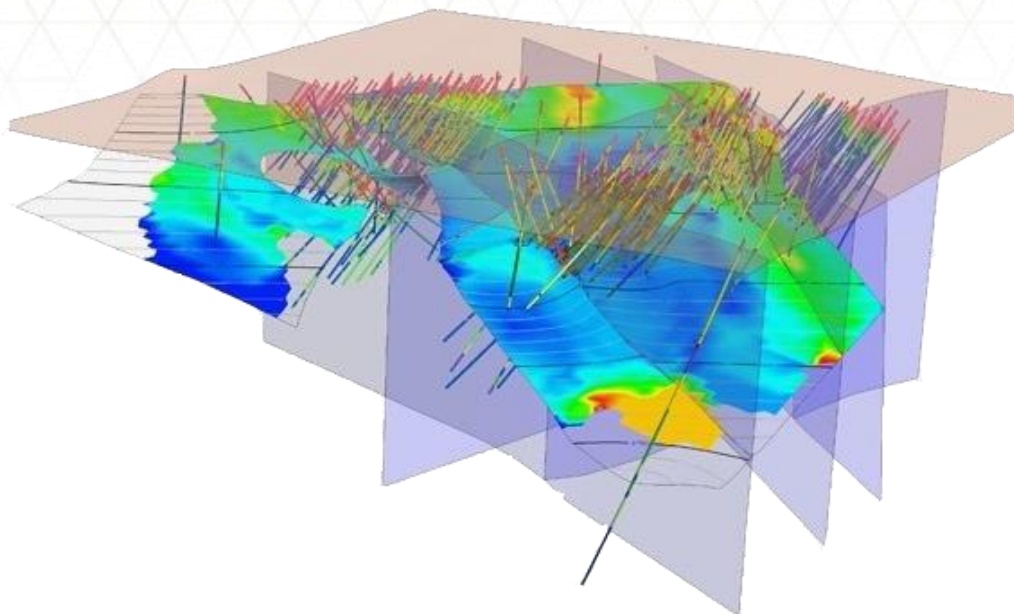
- *Geotechnical hazard estimation, identification, and monitoring.*
- *Import and include disparate active mine data into 3D integrated models.*

Targeting Workflow Module

- *Geohazard identification using point, curve, region, surface, and grid/voxel data types.*
- *Combination, inclusion or exception and proximity-based querying.*
- *Knowledge-driven, data-driven approach or integrated machine-learning results.*
- *3D visual reference, reporting, and auditable workflow.*

Integrated Modelling Package

Users: Interpretation Geologists, Structural Geologists, Geochemists



Packaged for integrated modelling work on projects at deposit, project or regional scale. Includes the full capability of the Advanced Interpretation Package and adds an implicit fault network builder and specific functionality for leveraging multi-disciplinary data with variable, sparse or discontinuous spatial coverage for integrated 3D mineral potential modelling and targeting. Faulted horizons can be implicitly modelled, and updated or adjusted using a vast array of explicit editing/creation tools in 3D or 2D cross-sections. Adding the optional ioGAS-GOCAD Mining Suite Link presents the ideal configuration for querying, interrogating, visualizing, and targeting geochemical and alteration signatures.

GOCAD 3D Mining Viewer + Foundation Modelling Module

Multi-Core Support for Foundation Modelling Module

Maps, Cross-Sections, and Log Display Module

Mining Utilities Module

3D-GIS Module

Well Correlation and Stratigraphic Analysis Module

Interpretation Modelling Module

Velocity Modelling and Time-to-Depth Conversion Module

+

SKUA Structure with Multi-Core Processing Module

- *Implicit modeling of complex fault networks and stratigraphic horizons with or without drillhole data.*
- *Allows overturned folds as well as reverse and dying faults.*
- *Works in tandem with a stratigraphic column and includes depositional relationships between formations.*
- *Leverages multi-core processing capability for rapid processing.*

Targeting Workflow Module

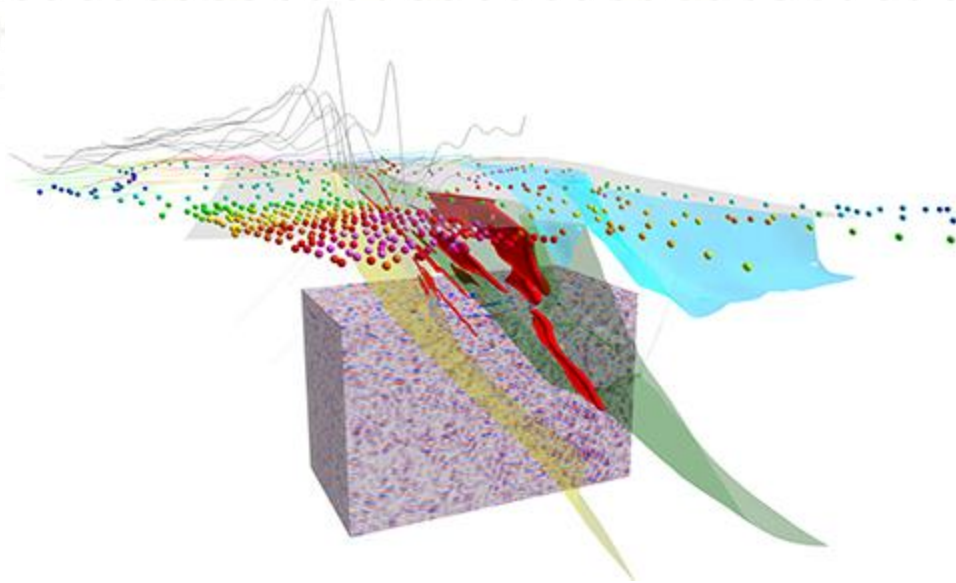
- *3D mineral potential targeting using point, curve, region, surface, and grid/voxel data types.*
- *Combination, inclusion or exception and proximity-based querying.*
- *Knowledge-driven, data-driven approach or integrated machine-learning results.*
- *3D visual reference, reporting, and auditable workflow.*

Sparse

- *Quickly build 3D surfaces from sparse datasets.*
- *Quickly build 3D geology models from surface data only.*
- *3D Structural Fields Interpolator supporting bedding and foliation data.*
- *Parametric interpolators: NURBS, Bezier, Hybrid.*

Advanced Geophysics Package

Users: Geophysicists



Primarily for geophysicists, but also has exceptional functionality for structural geologists. Includes the full capability of the Advanced Interpretation Package plus specific functionality for geophysical inversion, interpretation, and rapid structural geology incorporation, which is critical to the constrained geophysical inversion process. Includes unique geologically-driven inversion software (VPmg).

GOCAD 3D Mining Viewer + Foundation Modelling Module

Multi-Core Support for Foundation Modelling Module

Maps, Cross-Sections, and Log Display Module

Mining Utilities Module

3D-GIS Module

Well Correlation and Stratigraphic Analysis Module

Interpretation Modelling Module

Velocity Modelling and Time-to-Depth Conversion Module

+

SKUA Structure with Multi-Core Processing Module

- *Implicit modelling for stratified geological settings.*
- *Builds complex fault networks and stratigraphic horizons.*
- *Allows overturned folds as well as reverse and dying faults.*
- *Works in tandem with a stratigraphic column and includes depositional relationships between formations.*
- *Leverages multi-core processing capability for rapid processing.*

VPmg Package Module

- *Constrained inversion code operating directly on the geologic model.*
- *3D gravity and gravity gradient inversion and forward modelling.*
- *3D magnetic and magnetic gradient inversion and forward modelling.*
- *3D self-demagnetization.*

VPem1D Module

- *Airborne 1D TEM inversion program with the same geometry inversion approach used by VPmg.*

Potential Fields Module

- *Modelling and inversion for gravity and magnetics.*
- *Leverages 3D geological models, structure, geometry, and physical properties as inversion constraints.*
- *Works seamlessly with VPmg and UBC-GIF MAG3D and GRAV3D inversion codes.*

Electromagnetics Module

- *Modelling and inversion for electrical and electromagnetic data.*
- *Electrical: Inversion, forward modelling, and editing of 2D and 3D DC Resistivity and Induced Polarization (IP).*
- *Electromagnetics: Inversion, forward modelling, and editing of time-domain airborne EM.*
- *Leverages 3D geological models, structure, geometry, and physical properties as inversion constraints.*
- *Works seamlessly with VPem1D, VPem3D as well as UBC-GIF DCIP2D, DCIP3D, EM1DTM, EM1DFM inversion codes.*

Seismic Module

- *3D forward modelling for hard rock environments (2D and 3D synthetic seismograms).*
- *Models seismic reflections data using 3D geological and physical properties models.*
- *2D forward modelling and inversion provides straight and curved ray time-travel within discretized 2D planes.*

Stratigraphic Modelling Package

Users: Interpretation Geologists, Structural Geologists, Resource Geologists

Packaged specifically for modelling of stratified depositional environments and ore bodies with folded and/or faulted 3D grids in a stratigraphic space. This is a comprehensive offering that includes the full capability of the Advanced Interpretation Package plus industry-leading stratigraphic and structural implicit modelling. Contains complete geostatistics for resource modelling and estimation for stratified ore bodies, as well as structural restoration capability.

GOCAD 3D Mining Viewer + Foundation Modelling Module

Multi-Core Support for Foundation Modelling Module

Maps, Cross-Sections, and Log Display Module

Mining Utilities Module

3D-GIS Module

Well Correlation and Stratigraphic Analysis Module

Interpretation Modelling Module

Velocity Modelling and Time-to-Depth Conversion Module

+ SKUA Structure with Multi-Core Processing Module

- *Implicit modelling for stratified geological settings.*
- *Builds complex fault networks and stratigraphic horizons.*
- *Allows overturned folds as well as reverse and dying faults.*
- *Works in tandem with a stratigraphic column and includes depositional relationships between formations.*
- *Leverages multi-core processing capability for rapid processing.*

SKUA Stratigraphy and Fault Analysis with Multi-Core Processing Module

- *Implicit modelling of 3D geological grids for stratified geological settings.*
- *Builds the optimum grid for geostatistics; faulted and folded grids with parametric space equivalent.*
- *Leverages fault networks and horizon grid outputs from SKUA Structure.*
- *Provides the ideal grid for stratified deposit geostatistics and volumetric computation.*
- *Leverages multi-core processing capability for rapid processing.*

Reservoir Properties

- *2D and 3D geostatistical estimation and simulation workflows.*
- *Works with both continuous and discrete properties.*
- *Advanced search ellipsoid parameters.*
- *Post-processing functionalities for simulations.*
- *Wide variety of kriging and simulation methods.*
- *Proper geostatistical domain blending.*