Uncertainty modeling in the extension of geological units for evaluation of mineral resources

DESCRIPTION

The evaluation of mineral resources is largely conditioned by geological properties such as rock types, mineral zones or alterations, which define homogeneous domains called “geological units” that partition the deposit to be evaluated. Currently, these units are usually modeled deterministically, based on available sampling information and expert knowledge. This approach leads to models where geological boundaries are smoothed and do not reflect actual geological variability in the reservoir. In this context, the project has developed the GeoGnoSim software for stochastic modeling of geological units, which allows generating multiple scenarios that can be compared to reality that help quantify geological uncertainty and support decision-making in the valuation, planning and operation of mining projects.

MARKET

The software is aimed at geologists and engineers working in mining companies and consulting companies in the evaluation of resources and mining reserves, as well as academics and researchers who work in universities that offer a degree in mining engineering or geology.

APPLICATIONS

The software can be applied mainly for geological reservoir modeling in the early and advanced exploration stages. This modeling conditions the evaluation and classification of mineral resources, impacts the quantification of geological uncertainty, and guides decision-making, such as the identification of areas with economic potential that must be recognized with additional sampling.

▲ GeoGnoSim: The stochastic modeling software for geological units

ADVANTAGES

1. GeoGnosim allows quantifying the uncertainty in the spatial extent of geological units, integrating the necessary tools to carry out the modeling and management of geostatistical simulations for decision-making. This affects the various stages of a mining project, in particular in the evaluation of the grades and quantities of metal contained in the deposit, the design and planning (sequencing and definition of a production program) and the economic evaluation of the project of its risks or opportunities.
2. The software is characterized by offering flexible modeling, adaptable to complex geologies, in particular, to deposits made up of numerous geological units whose contact relationships are varied.
3. The software also stands out for its ease of use and learning for end users (resource geologists, mainly).

INTELLECTUAL PROPERTY

Intellectual property shared with Fundación COPEC-UC (35%) and Universidad de Chile (65%). Commercial rights must also consider the counterpart company Geoinnova.

The program’s source codes were registered with the Directorate of Libraries, Archives and Museums (DIBAM). The GeoGnoSim brand and logo were registered with the National Institute of Industrial Property (INAPI).

TECHNOLOGY DEVELOPMENT STATUS

The generation of a stand-alone software was completed, installable in equipment without the need for additional libraries, which has a graphical interface. The routines were tested through several case studies of copper and gold deposits. A study of technological valorization and business model was carried out and work is being done on the definition of a commercialization plan.

INVENTORS

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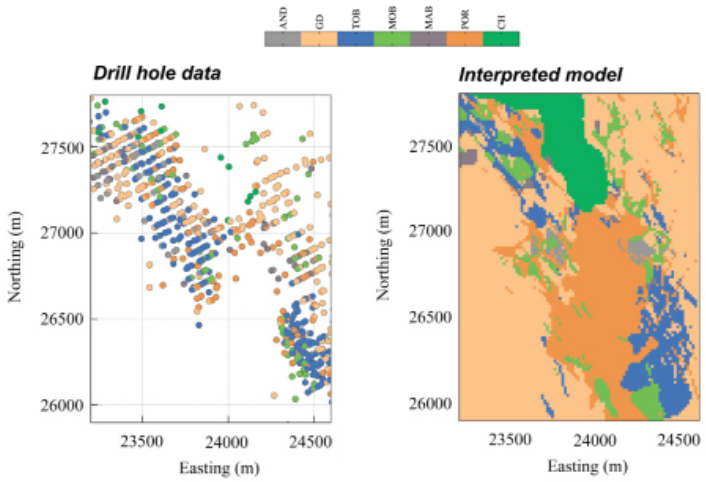
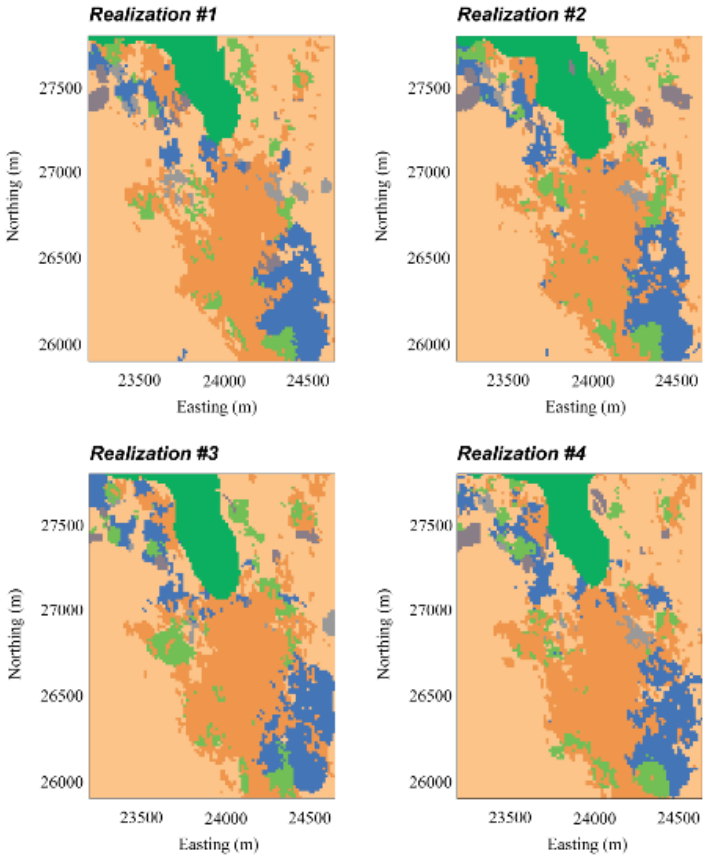
OPPORTUNITY

The GeoGnoSim software provides a novel solution in the mineral resources industry, since the existing alternatives for building geological models often only allow the construction of deterministic models, or they are complex to learn, little flexibility or poor scientific base, limiting their use to a small circle of specialists. The generation of several geological scenarios is essential to later quantify the quantity and quality of mineral resources and the associated uncertainty, which in turn facilitates the economic evaluation of mining projects in the presence of geological uncertainty and allows decisions to be made that reduce this uncertainty, increase the expected profit and / or increase the reliability and predictability of plans and projections around the operation.



▲ The first image (above, left) shows the geological mapping information from exploration drilling in a copper deposit. Below, the interpretation made by geologists delimiting seven main lithological domains.



▲ Four simulated scenarios that reflect the uncertainty in the true position of the borders between lithological domains.

FOR MORE INFORMATION

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