Geovariances
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ABSTRACT

Mineral resource categorization: current issues, best practices and easy-to-run tools

One of the current issues that the mining industry is facing is how to choose a mineral resource categorization that is both compliant with international codes and applicable to any deposit. Mining companies do not wish to have as many methods as deposits, but are more willing to have one or two techniques that are suitable to all deposits, whether it is Alumina, Copper, Nickel or Iron.

Defining measured, indicated and inferred mineral resources is key for any mining company and the negative impact of misclassification can even reduce the life of mine of a mining operation.

The CIM definition Standards states that ''*An Indicated Mineral Resource is that part of a Mineral Resource […] estimated with sufficient confidence to allow the […] evaluation of the economic viability of the deposit. Geological evidence is derived from adequately detailed and reliable exploration, sampling and testing and is sufficient to* ***assume*** *geological and grade […] continuity*'' and ''*A Measured Mineral Resource is that part of a Mineral Resource […] estimated with confidence sufficient to allow the […] final evaluation of the economic viability of the deposit. Geological evidence is derived from detailed and reliable exploration, sampling and testing and is sufficient to* ***confirm*** *geological and grade […] continuity".*

The notion of geological continuity and its antonym variability are key in this general definition and the best way to assess the geological continuity is through the analysis of the spatial variability. The more a deposit is sampled, the more information is available, and consequently the more reliable is the estimation of the phenomenon.

A rule proposed by Harry Parker has been used as best practice to categorize mineral resources into indicated or measured that is based on confidence intervals:

- Measured: +/- 15% with 90% confidence on a month or quarter of production
- Indicated: +/- 15% with 90% confidence on an annual production

To assess the uncertainty, two methods are recognized as best practices and are both available in Isatis: conditional simulations and spatial sampling density variance. Both give practical tools to define measured and indicated resources based on the variability of estimation and simulations.

Conditional simulations are commonly used nowadays and although their application is highly time consuming, it is probably the most accurate method. Simulations might also indicate the areas where additional drilling is required due to increased variability of the element of interest.

The spatial sampling density variance module allows measuring the efficiency of a drill-hole pattern. This method uses less time than simulations, and will give results that are less accurate, but also can help optimizing the drilling pattern that is required for resources categorization.

Both methods may handle multivariate cases and it is accepted that auxiliary variables may play an important role in resources categorization as they can impact directly on the recovery of the elements.

This paper will provide detailed methods on how to use conditional simulations and spatial sampling density in Isatis, and the benefits and limitations of each. For each method, a case study will be presented.