PhD Open Days

INTEGRATION OF UNCERTAINTY DATA IN BLOCK ESTIMATION/SIMULATION OF RESERVES

CERENA Centro de Recursos Naturais e Ambiente

PhD Program Earth-Resources

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Introduction

In the mining sector, the decisions from mineral exploration to mining are conditioned to the quality of samples. In exploration stage the sampling taken with the technique of diamond drilling hole are normally accurate and precise, but, unfortunately, they are expensive and, consequently, scarce. These samples are considered "hard data". The uncertainty and the risk of reserves reflect the scarcity of samples and the lack of knowledge of the reality. During the development the mining, in production phase, samples can be taken by blast holes or face samples. They are cheaper and more abundant, but it has high uncertainty, it is considered "soft data".

Figure 1 shows forms to obtain different types and quality of samples in the mining: a) a diamond drilling hole, b) reverse circulation.
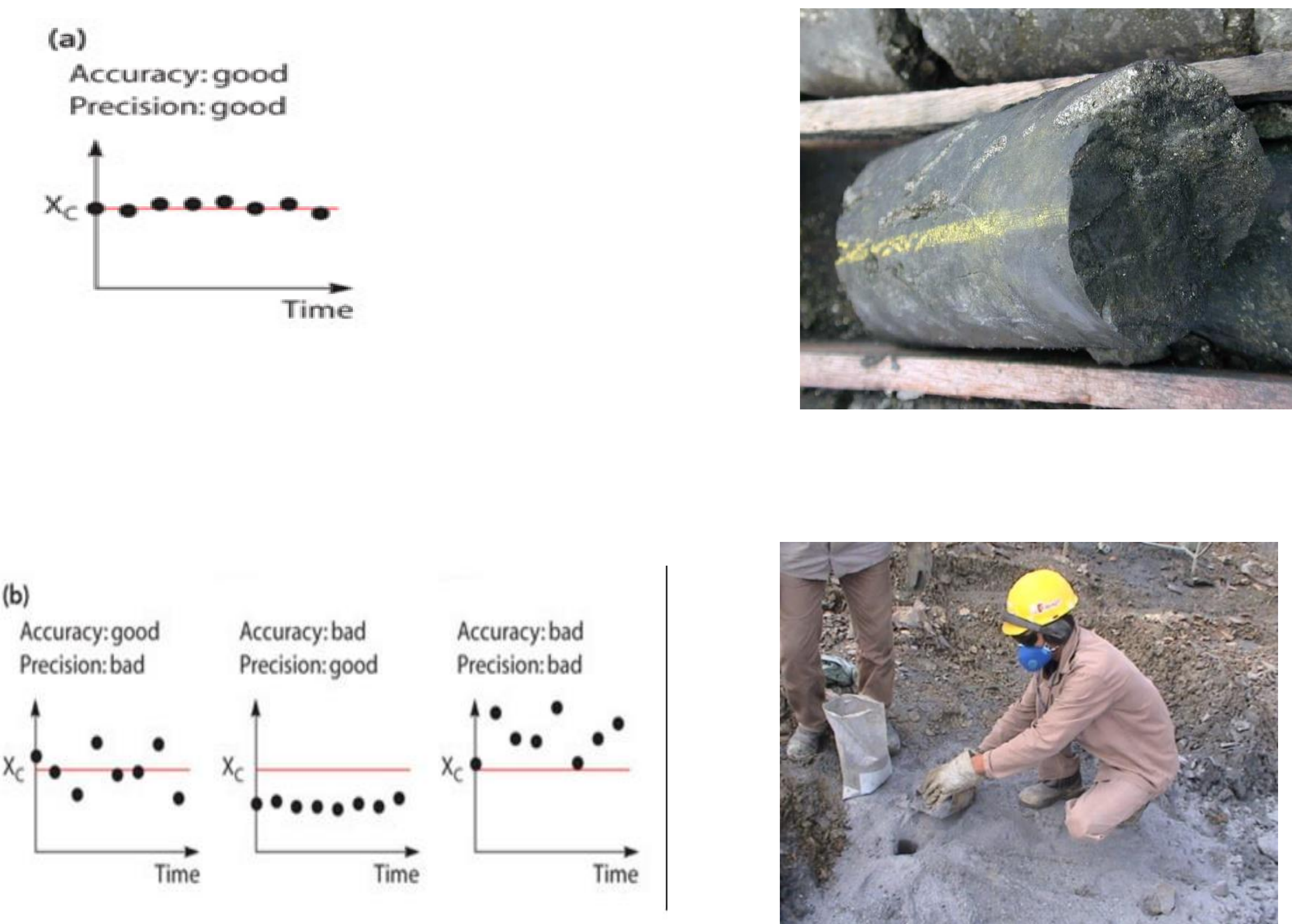

Figure 1- Samples collected with different methods in the mining: a) diamond drilling hole, b) reverse circulation.

Methodology

The proposed method intends to combine these different uncertain data in a unique model of reserves for risk evaluation. The idea is to integrate the uncertainty of the "soft"/uncertain data, by using stochastic simulations of block support, based on point probability distributions simulations.

Proposed Worflow

i) Integrate the uncertainty different volumetric/quality data with Block Direct Sequential Simulation (Block-DSS)
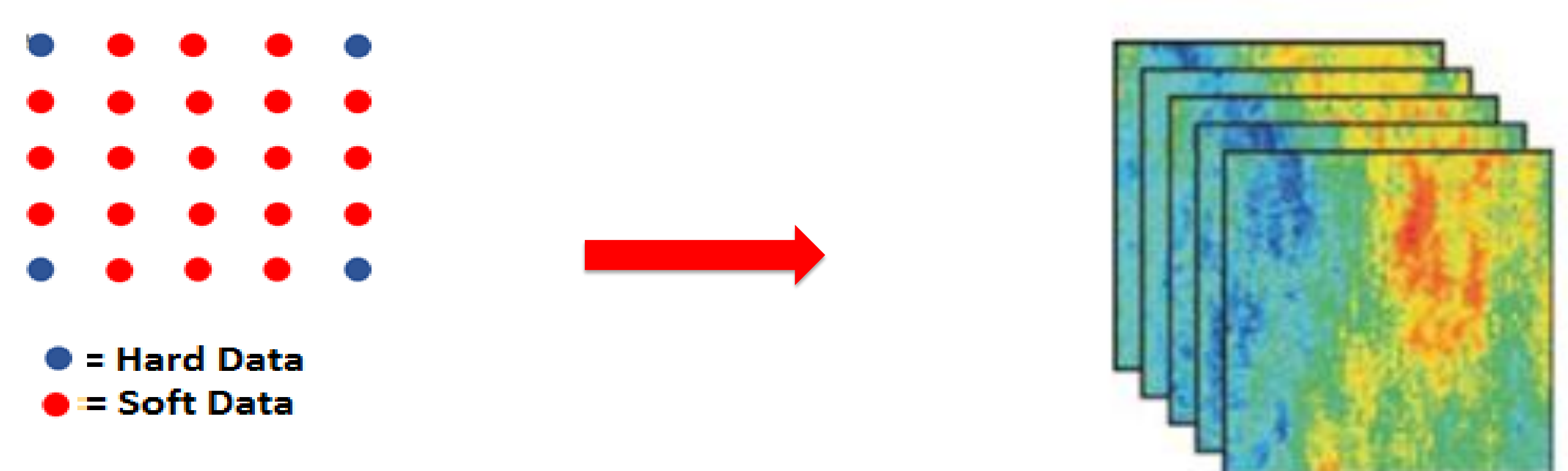
● = Hard Data
● = Soft Data

ii) Build the point distributions with the parameters of the Block-DSS.
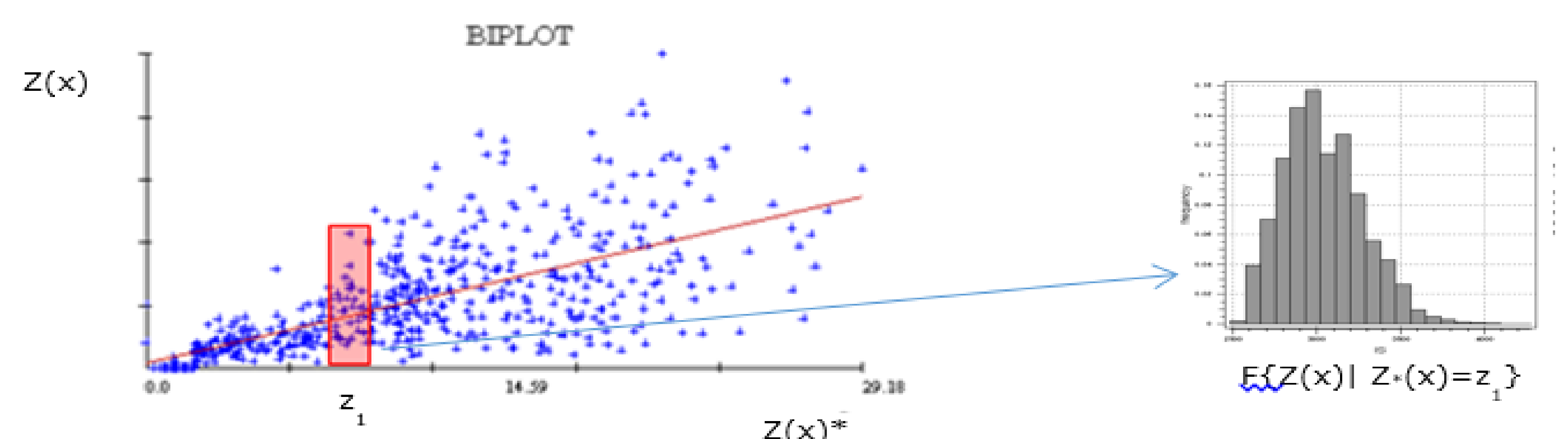
iii) The direct sequential simulation (DSS) starts by generating first the Nd values at the hard data location before simulate the N regular grid nodes. After a set of Nd data values are generated from the point distributions, in a second stage, the direct sequential simulation method generates z(x) values on the entire grid of nodes.

Expected outcome

- The key idea is to make full use of all data sources available while carefully dealing with bias and of unequal sampling.

- Improve short term geological modelling whether an appropriate methodology is used to include these data.

- Increase of recovery of the ore in the mine. Thus, a more precise estimation/simulation method leads to a correct decision in choosing the destination of each mined block.

References

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