



## Estimation of copper ore deposit parameters – case study of Rudna Mine mining block R-1 (SW part of Poland) using geostatistics

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This geostatistical study investigates the variation in the basic geological parameters of the lithologically varied deposit in mining block R-1 in the west (W) part of the Rudna Mine (the region Lubin – Sieroszowice, SW part of Poland).

Data obtained from the sampling (sample size  $N = 708$ ) of excavations in block R-1 were the input for the spatial analyses. The data are the results of chemical analyses of the Cu content in the (recoverable) deposit series, carried out on channel samples and drilled core samples, taken systematically at every 15-20 m in the headings.

The deposit profile comprises various rock formations, such as: mineralized Weissliegend sandstones, intensively mineralized upper Permian dolomitic-loamy and loamy copper-bearing schists and carbonate rocks: loamy dolomite, striped dolomite and limy dolomite, of various thickness. No schists formed in some parts of block R-1, which are referred to as the schistless area. The deposit series here is considerably less mineralized (comparing with other mining blocks) even though the mineralization thickness of the sandstone and carbonate rocks reaches as much as 20 m.

The variation in the Cu content and thickness of the recoverable deposit and the estimated averages  $Z^*$  of the above parameters were modelled using the variogram function and the ordinary (block) kriging technique. The efficiency of the estimations was characterized.

As part of the further spatial analyses the  $Z_s$  values of the analysed deposit parameters were simulated using the conditional turning bands simulation. Confidence intervals for the values of averages based on the estimated averages  $Z^*$  and averages based on the simulated values (realizations)  $Z_s$ , showing the uncertainty of the estimations and simulations, were calculated.

The results of the analyses clearly indicate the shifting of the mineralized zone (the mineralizing solutions), sometimes into the sandstones while spreading throughout the floor of calcareous-dolomitic formations and sometimes into the carbonate rocks, partly entering the roof layers of sandstones. It can be concluded that the process of deposit formation and copper mineralization variation had a multiphase character and the lateral and vertical relocation of the valuable metal ores could play a significant role.

The combination of various geostatistical techniques - estimation and simulation - will allow for

more effective management of natural resources of mineral resources, including copper ore deposits.