Paper Number: 4622

Assessment of Mineral Resources Potential by combining Monte Carlo and Weights of Evidence Models

Pu, Luping[1], Xiao, Keyan[2], Wang Xinqing[3] and Zhu Guoqi[4]

[1] College of information Science and Engineering, Guilin University of Technology, Guilin, China, lupingpu@qq.com

[2] Institute of Mineral Resources, Chinese Academy of Geological Sciences, Beijing,China

[3] Faculty of Earth Resources, China University of Geosciences, Wuhan, China

[4] The Geophysical Investigation Institute of Guangxi Zhuang Autonomous Region, Liuzhou, China

---

Monte Carlo type simulation is used to obtain a probability distribution of mineral resource potential for specifc deposit type within specifc areas. Extensive sampling of known mineral deposists in the area provides a statistical model for the potential tonnes and grade of unknown mineral deposits. The number of potential deposits in an area is based on expert geoscientific opinion[1] that takes into account the metallogenic geological setting and available prospecting information. This is a somewhat subjective approach.

The Weight of Evidence Model [2] for the assessment of mineral resource potential is a GIS-based multivariate statistical method. The samples consist of closely spaced grid cells across multiple layers of different types of geoscientific information. The vector component of each grid cell is binary and depends on the nature of information on the layer of geoscientific information. The ore-bearing posteriori probability of each grid cell is calculated according to the Bayesian principle with the data gathered for each of the samples. Finally, metallogenic prospect zones are identified by grid cells for which the *a posteriori* probability is greater than a predetermined threshold.

The threshold of the metallogenic prospect zone can be set at different levels, corresponding to different probabilities for the occurrence of mineralization within grid cells. This change also directly affects the number of prospective grid cells in the model. On this basis a statistical model for the probability of ore-formation in a specifc grid cell, and within a speicif region, can be established.

The combination of grid-based Monte Carlo mineral resource potential assessment and the Weight of Evidence approach allows the number of potential ore-bearing grid cells in an area to be calculated without the subjective input of expert opinion. The method is therefore more objective, and can be used to provide a statistically based forecast of mineral prospectivity in an area. An application of the method is presented through a case study of the assessment of resource potential in the tin-rich metallogenic province in South China.

References:

[1] Singer D A. 1994. The relat ionship of estimated number of undiscovered deposits to grade and tonnage models

in three-part mineral resources assessments. International Association of Mathematical Geology , Geology Annual Conference, Papers and Extended Abstracts : 325 - 326.

[2] Agterberg, E P., and Bonham-Carter, G. F. 1990. Deriving weights of evidence from geoscience contour maps for the prediction of discrete events. In Proceedings 22nd APCOM Symposium, Berlin, September 1990: Technical University, Berlin, v. 2, 381-396.