Geophysical Research Abstracts
Vol. 12, EGU2010-13090-1, 2010
EGU General Assembly 2010

Direct statistical modeling and its implications for predictive mapping in mining exploration

Boris Sterligov (1,2,3), Charles Gumiaux (1), Luc Barbanson (1), Yan Chen (1), Daniel Cassard (3,4), Sergey Cherkasov (3), and Ludmila Zolotaya (2)

(1) University of Orléans, CNRS/INSU, University François Rabelais - Tours, Institut des Sciences de la Terre d'Orléans - UMR6113, Campus Géosciences, 1A rue de la Férollerie, 45071 Orléans cedex2, France, (2) Moscow State University Lomonossov, Geology Faculty, Leninskye Gori, 119992, Moscow, Russia, (3) Russian-French Metallogenic Laboratory, 11 Mokhovaya, 125009, Moscow, Russia, (4) BRGM, Resources Mineral Division, 3 av. Claude Guillemin, BP36009, 45060, Orléans Cedex 2, France

Recent advances in geosciences make more and more multidisciplinary data available for mining exploration. This allowed developing methodologies for computing forecast ore maps from the statistical combination of such different input parameters, all based on an inverse problem theory. Numerous statistical methods (e.g. algebraic method, weight of evidence, Siris method, etc) with varying degrees of complexity in their development and implementation, have been proposed and/or adapted for ore geology purposes. In literature, such approaches are often presented through applications on natural examples and the results obtained can present specificities due to local characteristics. Moreover, though crucial for statistical computations, "minimum requirements" needed for input parameters (number of minimum data points, spatial distribution of objects, etc) are often only poorly expressed. From these, problems often arise when one has to choose between one and the other method for her/his specific question. In this study, a direct statistical modeling approach is developed in order to i) evaluate the constraints on the input parameters and ii) test the validity of different existing inversion methods. The approach particularly focused on the analysis of spatial relationships between location of points and various objects (e.g. polygons and /or polylines) which is particularly well adapted to constrain the influence of intrusive bodies – such as a granite – and faults or ductile shear-zones on spatial location of ore deposits (point objects). The method is designed in a way to insure a-dimensionality with respect to scale.

In this approach, both spatial distribution and topology of objects (polygons and polylines) can be parametrized by the user (e.g. density of objects, length, surface, orientation, clustering). Then, the distance of points with respect to a given type of objects (polygons or polylines) is given using a probability distribution. The location of points is computed assuming either independency or different grades of dependency between the two probability distributions. The results show that i)polygons surface mean value, polylines length mean value, the number of objects and their clustering are critical and ii) the validity of the different tested inversion methods strongly depends on the relative importance and on the dependency between the parameters used. In addition, this combined approach of direct and inverse modeling offers an opportunity to test the robustness of the inferred distribution point laws with respect to the quality of the input data set.