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New developments in Mineral Prospectivity Mapping at BRGM: an overview.

Tourliere, B[1], Billa, M.[1], Cassard, D.[1], Angel, J.M.[1] , Pakyuz Charrier, E.[2], Bertrand, G.[1]

[1]BRGM, Bureau de Recherches Géologiques et Minières, Orléans, France – b.tourliere@brgm.fr
[2]CET, Center for Exploration Targeting, University of Western Australia, Crawley, Australia

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For several years, an objective of BRGM has been to minimize the impact on mineral prospectivity of inaccuracies of geographic location of objects and to take into account the incompleteness of attributes that are used for calculation. In this regard BRGM has been developing methods based on the frequency of association of parameters in order to solve difficulties related to methods classically used in prospectivity mapping [1]. Both methods presented herein use a learning core derived from a reference set of mineral occurrences, based on which objects showing similar signatures in the area of study are sought:

The first method is Data Base Querying (DBQ) [2]. It was developed to evaluate the favorability of deposits for critical byproduct elements (e.g. Ge, Ga…). It relies on the study of distribution of major metallic elements (e.g. Pb, Zn, Ag, Cd…) reported in a mineral occurrences database. After grouping all occurrences in homogeneous “metallogenic families”, characteristic polymetallic signatures are identified for each group, from occurrences where the targeted byproduct commodity is known to occur. Each occurrence of a favorable group is then quantitatively evaluated (ranking) for its likelihood to contain the targeted byproduct commodity, based on its similarity to the characteristic polymetallic signature of its group.

The second method is Cell Based Association (CBA) [3]. It is based on the meshing of the area of study into regular cells and the identification, in each cell, of the association of values of all variables in terms of presence (1) or absence (0). From this dataset, one could choose from two different ways to identify prospective areas: 1. one that uses Hierarchical Ascending Classification (HAC) in order to sort associations found in the cells, then to identify those associated with the targeted commodity, in order to seek them within the whole area of study; 2. one that calculates a ranking from associations found in the learning set, in order to measure similarity of each cell to this set. Several ways of ranking calculation are possible, either based on frequency of occurrence of each parameter (similarly to DBQ) in cells of the learning set, or based on the count of associations from the learning set in all cells of the area of study. This second approach allows for differentiated scores on the prospective cells.
A benefit of the CBA method it that it does not depend on the accuracy in positioning points and polygon contours, that therefore minimizes the impact of mapping uncertainties.

Both methods have been applied at various scales yielding promising prospective results.

References:

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