MINERAL POTENTIAL MODELLING WITH A GEOGRAPHIC INFORMATION SYSTEM

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ABSTRACT

Geographic information systems not only supply the tools for building and accessing a multi-map geoscientific database, they can also provide the computing platform for developing and testing mineral potential models. In general, such models are algorithms for combining multiple input maps (geology, geophysics, geochemistry) to produce an output map of mineral potential, in some cases with an associated uncertainty map.

In relatively well-explored regions, with an abundance of known mineral showings, predictive mineral potential modelling can use either regression techniques or a new Bayesian method known as 'weights of evidence' modelling. For example, gold potential in the Meguma terrane, Nova Scotia has been mapped by combining weights of evidence from lithology, distance to contacts and structures, with lake-sediment and biogeochemical signatures. Areas where the estimate of mineral potential is uncertain are masked out. The model not only predicts all the important gold districts, but also shows when areas of high potential occur with no known mineralization.

For the Star Lake area, with too few sites of known mineralization for statistical predictive modelling, expert opinion can be used to generate a series of trial models. The 'weights of evidence' framework can still be used, but instead of measuring the overlap relationships of known occurrences with the predictor maps, the expert is asked to estimate these relationships.

The modelling language and interactive graphical display of the geographic information system facilitate the experimentation with a variety of models. These experiments yield a series of mineral potential maps; the maps are neither 'right' nor 'wrong', but simply products of the assumptions, similar to Chamberlin's multiple working hypotheses, and aid the exploration process.