

Modelling the Distribution of Gold Deposits in the Superior Province using Multifractal Methods.

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The Superior Province, accounting for most of the *Canadian Shield* is the largest Archean craton and represents almost a quarter of all exposed Archean crust. Economically, it is one of the most important mining districts in the world. As such, the province's medium and long term potential for mineral exploration has remained an important issue but is difficult to gauge either quantitatively or descriptively. This research represents the first attempt to quantitatively estimate exploration potential on the provincial scale using multifractal methods.

The distribution of economic gold discoveries within the Superior Province is shown to represent a multifractal distribution. This measure of potential will help set up guidelines for formulating exploration strategies such as *where* to explore, and how *intensively* to explore. Unfortunately, due to the variety of geological conditions recorded within the province, it is unlikely any quantitative estimates of contained metal will be *universally* scale invariant. This reflects data limitations rather than model inadequacy. Sensitivity to initial conditions, a property of chaotic dynamics may also be a factor.

The multifractal distribution of measurable quantities such as concentration, tonnage and deposit location, also reflects the scale invariance of patterns in both features constraining deposits (e.g. structural regimes) and associated ore forming processes. Therefore, multifractal methodology would appear an appropriate tool for probability estimates of metal content arising from the actions of self-similar paragenetic mechanisms in complex ore forming systems.