Hypercube®: A new tool for the study of the mineral potential

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The continued discovery of mineral resources is a daily challenge, and new, good-quality exploration targets need to be constantly generated in order to improve discovery rate. Creating mineral potential maps is one of the first steps of this process, but the different methods and/or algorithms involved in the process have limitations. The algorithm used by the software Hypercube®, developed by BearingPoint, can predict rare events, such as a mineral occurrence, by its capacity to analyse a large group of heterogeneous data and generate selecting-rules based on multiple variables associated with a specific event. Its efficiency in comparison to other methods has been demonstrated in diverse industries, such as in medical research, however, its use in the mining industry has been limited by the fact that Hypercube® cannot directly manage spatially referenced data. IOS Services Géoscientifiques initiated a research and development program to apply Hypercube® predictive algorithms in the mining exploration industry with the goal of more accurately predicting the mineral potential of areas of interest. This required: 1) the development of a protocol for integrating Hypercube® in a process using spatially referenced data; and 2) a method to validate the performance of Hypercube® predictions based on its capacity to find randomly-hidden known mineral deposits. To properly evaluate the performance of the system, the James Bay area was chosen because of its mineral potential for orogenic gold and because it has previously been evaluated using another method by the Ministère de l'Énergie et des Ressources naturelles (MERN). The same dataset and library of known mineral deposits were used to ensure consistency. The method developed for this project includes an interactive process to format the SIGEOM database (public domain database managed by MERN) with a compatible Hypercube® format. The mineral potential map returned by Hypercube® has successfully found the main potential zones, which are associated with volcano-sedimentary rocks, that have been identified in the previous study. However, the new method using Hypercube® is shown to be more efficient, having been able to find 95% of the hidden deposits based on learning completed over only 50% of the dataset. In addition, new exploration targets were developed that have never been covered by significant fieldwork. This project was financially supported by IOS Services Géoscientifiques, the MITACS Accelerate funding and the Ministère de l'Énergie et des Ressources naturelles (MERN).