CANADA'S FIRST NATIONAL-SCALE MINERAL POTENTIAL MODEL

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Targeted government research has led to new conceptual models for tracing the source to ore pathways of Canada's Ni (± Cu ± PGE) deposits and their critical elements (Co). These conceptual models are freely available to the public, but, in some cases, have proven difficult to apply in practice because the geological proxies for processes that transport and concentrate ore components may be difficult to recognize in the rock record and/or may be impossible to map in areas with sparse data. Here we address those challenges using a new open source workflow and public geoscience data to build Canada's first national-scale mineral potential model for mafic to ultramafic rock-hosted Ni ore systems. We focus on mapping the continent-scale drivers, sources, and architecture of ore-forming systems in addition to their district- to deposit-scale depositional traps. Geological, geophysical, and geochemical datasets were converted to relative prospectivity scores using kernel density estimate ratios and the distribution of known mineral occurrences. The transformed datasets were then normalized, weighted, and combined using fuzzy logic, resulting in a knowledge-based mineral potential model for mafic to ultramafic rock-hosted ore systems that is guided by the characteristics of known deposits. Calculated Information Values, based on weights-of-evidence, suggest that lithology (sources), rock age (drivers), gravity anomalies (architecture), and crustal thickness (architecture) are some of the most predictive mappable criteria included in the model. Receiver operating characteristic (ROC) curves are used to compare hybrid and data-driven model results and to evaluate model performance across geological provinces. The results of this preliminary research track extensions of prospective settings under cover and identify hitherto unrecognized areas of high mineral potential for further analysis. Model results also highlight areas of poor geological control and/or sparse data that should be the focus of future targeted government and academic research.