

Geochemical Assessment of the Ni-Cu-PGE Potential in Intrusive Units of the 780 Ma Gunbarrel LIP, Western North America

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Abstract

Large Igneous Provinces (LIPs) have been associated with a variety of magmatic deposit types including Fe-Ti-V and Ni-Cu-PGE, and also diamonds in associated kimberlites and REE-Ta-Nb in associated carbonatites. The 780 Ma Gunbarrel LIP of western North America consists of mafic dykes, sills and volcanic rocks that are distributed over a distance of more than 2500 km from the Yukon, Canada to Montana State. These rocks are tholeiitic basalts to basaltic andesites and share remarkably consistent and similar geochemical signatures despite the vast distances between units. Geochemically, they have continental flood basalt type magmatism and exhibit a Nb-Ta depletion that suggests mixing with lithosphere that was modified during a prior subduction event. The melts also consist of chalcophile-element depleted and undepleted magmas based on (Pd/Yb)_{PM} vs. (Th/Yb)_{PM} plots which suggests occurrence of S-saturation and possible sulphide immiscibility. These and other commonalities with LIPs of known mineralization makes the 780 Ma Gunbarrel LIP a potential target for Ni-Cu-PGE deposits.