KOMATIITE-HOSTED NI-CU-PGE

	Source	Active pathway	Trap-chemical scrubber	Trap-chemical/ physical scrubber	Trap-physical throttle	Modification
Critical Process	Komatiitic magmatism	Transporting magma through the crust	Sulfur addition and saturation	Metals sequester into sulfides	Physical concentration of metal-rich sulfides	Modification of original orebody
Constituent Process: What are the processes that control the critical process?	High-degree partial melting of asthenosphere to produce komatiitic and ultramafic magmas, and crustal melting from mantle underplating to form felsic magmas High-flux magma pathways	Lithospheric faulting	Interaction with S-rich rocks to induce sulfur saturation Assimilation of country rocks to induce sulfur saturation	A high degree of physical interaction between sulfide droplets and metals in a komatiitic melt	Early timing of sulfide concentration-relative proportion of sulfide vs silicate minerals Structural pathways promoting fluid transport and alteration	Tectonic modification; e.g. folding, faulting duplication, remobilization of massive sulfides Hydrothermal alteration forming ore zones
Targeting: How can we target each constituent process?	Thick, abundant, laterally extensive ultramafic rocks Bi-modal magmatism Association with thick sequences of mafic rocks, indicating extensive, high-degree melting Archean granite greenstone terranes, where komatiites are most common (but also consider possible younger ages) Cumulate-rich rocks, indicated by texture and chemistry Morphology of komatiite indicating high-flux magma pathways e.g. embayments and channelized environments	Continental lithosphere margins, e.g. large scale/ deep penetrating faults; rocks coeval with or indicators of rifting	S-rich rocks and S concentration in komatiites Changes in komatiite chemistry (e.g. trace element chemistry which indicates crustal contamination)	Ni concentration in sulfides, e.g. identifying high Ni tenors	Sulfide vs silicate mineral ratios Ni content in olivine and pyroxenes (e.g. low Ni content in silicates may indicate high Ni in sulfides) Changes in morphology of komatiite channels	Fold hinges, intersecting faults, massive sulfides in felsic rocks Veins/veinlets that host Ni sulfides
Mappable Proxies: Which layers are needed and how are they created?	Komatiite occurrence map (m) (m+dhd+c+g+s+ WAROX+WAMEX) Ultramafic occurrence map (m+dhd) Komatiite thickness map (m+g+dhd) Felsic volcanic rock occurence map (m) Quartz andesite map (m) Rhyolite map (m) Dacite map (m) Felsic volcanic rock age map (m+chron) Synvolcanic granitic plutons (m) Mafic rock occurrence map (m) Mafic rock thickness map (m) Mafic classification map (m+c) Basalt classification map (m+c) Archean and Proterozoic rock age map (m+chron+ENS) Komatiite rock age map (m+chron+ENS) MgO >32 % map (m+c) Ni/Ti map (m+c) Ni/Ti map (m+c) Mg# map (m+c) Komatiite texture map (m+c+WAROX) Relative changes in komatiite thickness map (m+g) Volcanic facies model (m+c)	Structure complexity map (m) Magnetic structure complexity map (g) Gravity structure complexity map (g) Palaeocratonic boundary map (i) Felsic volcanic rock occurrence map (m) Quartz andesite map (m) Sanukitoid occurrence map (m+c) Lamprophyre occurrence map (m+c) Rhyolite map (m) Dacite map (m) Felsic volcanic rock age map (m+chron) Alkaline rock occurrence map (m+c) Cabonatite occurrence map (m+c) Syenite occurrence map (m+c) Pyroxenite occurrence map (m+c) Kimberlite occurrence map (m+c) Alkaline rock age map (m+chron) Coeval (sulfidic) sediments occurrence map (m+chron) BIF age and occurrence map (m+chron) VMS age and occurrence map (m+chron)	Sulfidic rock map (m+c+WAROX) Crustal contamination maps/plots (e.g. TiO_2 vs Zr, Sm vs La, Th vs Nb, Th vs YB; m+c)	Ni tenor maps (m+c)	Komatiite sulfide-silicate mineral texture map (m+c) Map of change in primary morphology in komatiites (m+g)	Fold hinge map (m+g) Intersecting faults map (m+g) Alteration mineral map (m+WAROX+ WAMEX) Geochemical anomaly map (m+c+hydro)

Data Sources

m = mapping
g = geophysical interpretation
i = isotopic ratios (e.g. Nd-Sm)
c = geochemistry
chron = geochronology

dhd = drillhole database
s = reflectance spectroscopy
WAMEX = WAMEX database /reports
WAROX = WAROX database
hydro = hydrochemistry data

reg = regolith map
soil = soil map

Blue text = geological proxy layer available in the Atlas

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