

Textural variations in the Eagle's Nest Ni-Cu-(PGE) deposit and implications for magma dynamics in a blade-shaped dike

N Zuccarelli¹, CM Lesher¹, MG Houle^{2,1}, RJ Weston³

¹Harquail School of Earth Sciences, Mineral Exploration Research Centre, Goodman School of Mines, Laurentian University, Sudbury, Ontario; ²Geological Survey of Canada, Natural Resources Canada, Québec, Québec; ³Noront Resources Ltd., Thunder Bay, Ontario;

The Eagle's Nest Ni-Cu-(PGE) deposit in the Ring of Fire intrusive complex of northern Ontario is hosted by a narrow ~200m NE-SW x ≤50m NW-SE x >1600m deep subvertical, structurally-rotated komatiitic dike. Sulfide mineralization is hosted mainly by harzburgite ± lherzolite and occurs almost exclusively along the northern (variably NE-NW) contact with granodiorite country rocks, consistent with mineralization being initially emplaced along the lower edge of a sub-horizontal blade-shaped dike. Massive, semi-massive, net-textured, and disseminated sulfide textures have been defined spatially and geochemically through detailed core logging, petrography, and whole-rock and mineral geochemical analyses. From surface down to 270m, ore textures grade southward (originally upward) from massive sulfide on the northern margin through semi-massive, net-textured, and disseminated sulfides to barren peridotite/pyroxenite on the southern margin. Between 270m and 350m the granodiorite/ultramafic contact curves strongly southward (upward) and minimal sulfides are present. At 350m the contact curves northward (downward) to its original orientation and massive sulfides re-appear along the contact. Between 300m and 350m, there is no evidence of tectonic displacement in drill core, so this change is interpreted as a 'topographic high' on which sulfides did not accumulate. Between 350m and 500m the northern contact is dominated by the presence of net-textured sulfides, with sporadic lenses of massive and semi-massive sulfide. Between 500m and 900m there are localized zones of 'disrupted-net texture' that consist of net-textured sulfides containing 3-5 cm thick zones of cross-cutting barren pyroxenite, interpreted to represent a late phase of more evolved magma that has infiltrated the peridotite-hosted mineralization. Between 900m and 1600m mineralization is predominantly net-textured with minor and localized semi-massive sulfide lenses. Overall, the variations in the sulfide segregation profile with depth (length) and the presence of disrupted net-textured mineralization supports the interpretation of Eagle's Nest as a dynamic, sub-horizontal blade-shaped dike involving multiple magma pulses and controls by intrusion geometry.