Invasive Features of Mafic-Ultramafic Rocks at the Zone 3, Zone 2, and Katinniq Ni-Cu-(PGE) Deposits, Raglan Formation, Cape Smith Belt, Nouveau-Québec

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The Raglan Formation occurs in the early Proterozoic Cape Smith Belt of northern Québec, a thin-skinned fold and thrust belt preserved in an east-west trending synclinorium in the Ungava segment of the circum-Superior suture zone (Hofmann, 1985; St-Onge et al., 1993a). It extends for at least 85 km along the broadly conformable boundary between a continental volcano-sedimentary rift sequence (Povungnituk Group) and MgO-rich to MgO-poor oceanic basalts (Chukotat Group) (Francis et al., 1983) and hosts several magmatic Ni-Cu-(PGE) deposits (Giovenazzo et al., 1989; St-Onge et al., 1993b; Lesher, 1999).

The Raglan Formation is composed of multiple ultramafic units that are locally columnar-jointed, are locally capped by microspinifex-textured breccias, and are intercalated with discontinuous horizons of mafic rocks and lesser sediments. They have been interpreted as channelized sheet flows and lava channel complexes representing the initial phase of volcanism in the Chukotat group (Gillies 1993; Thacker, 1995). The majority of the Ni-Cu-(PGE) mineralization in the Raglan Formation is hosted by ultramafic rocks at or near the base of the lava channels, within embayments along the contact with footwall mafic rocks and/or sediments (Gillies 1993; Thacker, 1995; Lesher et al., 1999). Because the volcanic setting of magmatic Ni-Cu-(PGE) deposits appears to be one of the most important controls on the localization and composition of the ores (Lesher, 1989), it is essential to understand whether the host rocks are lava channels, invasive lava channels, or sills.

The 8 km of Raglan Formation between Zone 3 and Katinniq is composed of one or two major peridotite-dominated units that transgress the gabbroic and sedimentary footwall rocks. Previous authors have interpreted the volcanic stratigraphy to be relatively conformable, based on the paucity, in surface exposure, of contact metamorphism in the overlying metasediments and the presence of microspinifex-textured and brecciated upper chilled margins (Barnes et al., 1990; Gillies 1993; Thacker, 1995; Lesher, 1999). However, the presence of microspinifex-textured peperites (Figs. 1 & 2) along upper subsurface (down-dip) contacts at Zone 2 and in the eastern and western subsurface sections of Katinniq, along with subsurface intrusive contacts between ultramafic rocks and overlying gabbros (Figs. 3 & 4) in areas at Zone 3 indicate that the ultramafic rocks post-date some of the overlying rocks. Although the regionally-extensive linear geometry of the ultramafic complexes and the linear geometries of the ore zones are inconsistent with an entirely intrusive origin (Lesher, 1999), the preponderance of invasive and intrusive features identified in this study suggest that the ultramafic units represents a complex invasive channelized system.

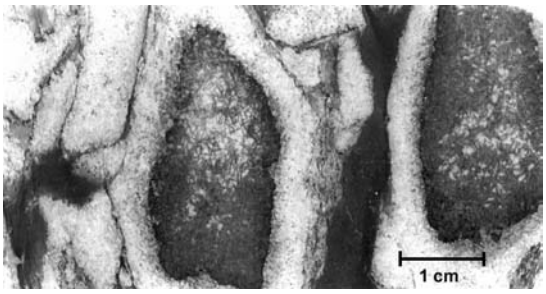

Figure 1. *Photomicrograph of a peperite showing pyroxene microspinifex textures in the cores (dark grey) and along the margins (light grey) of komatiitic basalt fragments in a matrix of massive argillaceous metasedimentary rock (black). (DDH# 718-1194/80.3m).*

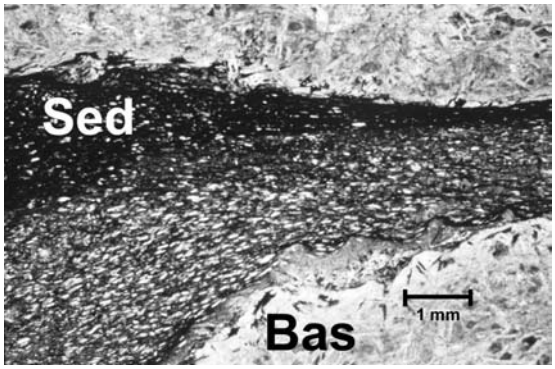

Figure 2. *Photomicrograph of same peperite in Fig.1 showing clastic semi-pelitic matrix (**Sed**) aligned sub-parallel to contact with microspinifex-textured komatiitic basalt fragments (**Bas**). (DDH# 718-1194/80.3m).*

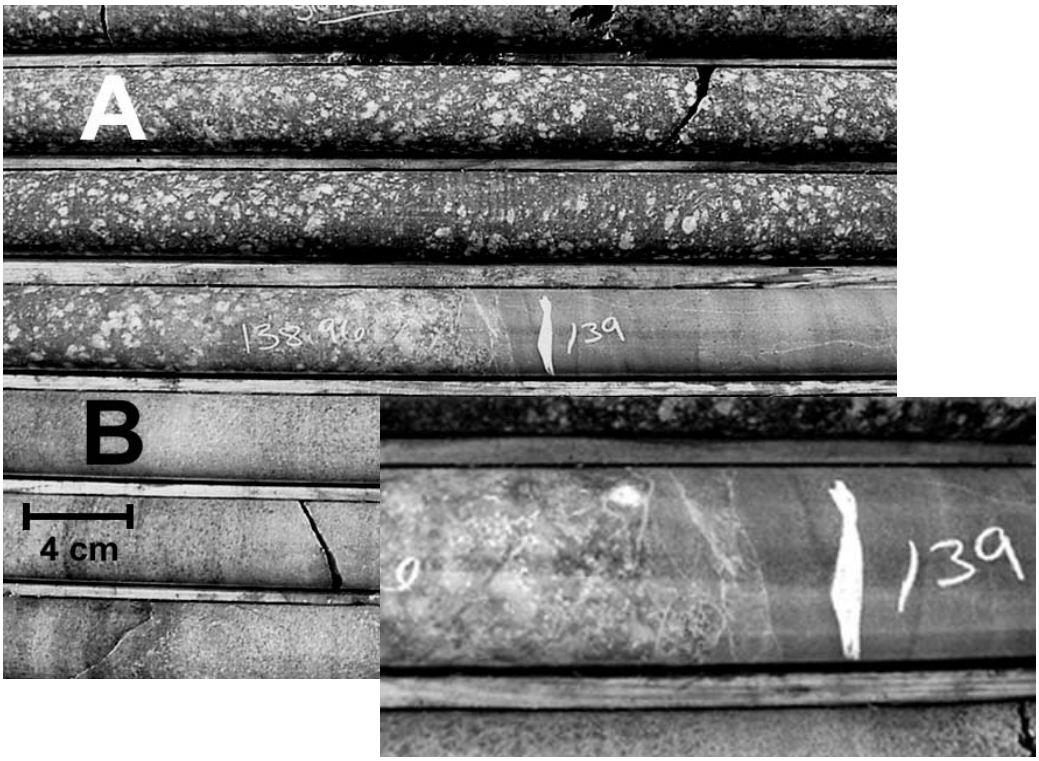

Figure 3. *Photographs of sharp, intrusive contact between contact metamorphosed hanging wall gabbro (**Gab**) and fine-grained chilled margin of underlying Raglan Formation ultramafic rocks (**UM**) in the eastern part of Zone 3. (DDH# 718-898/133m-143m).*

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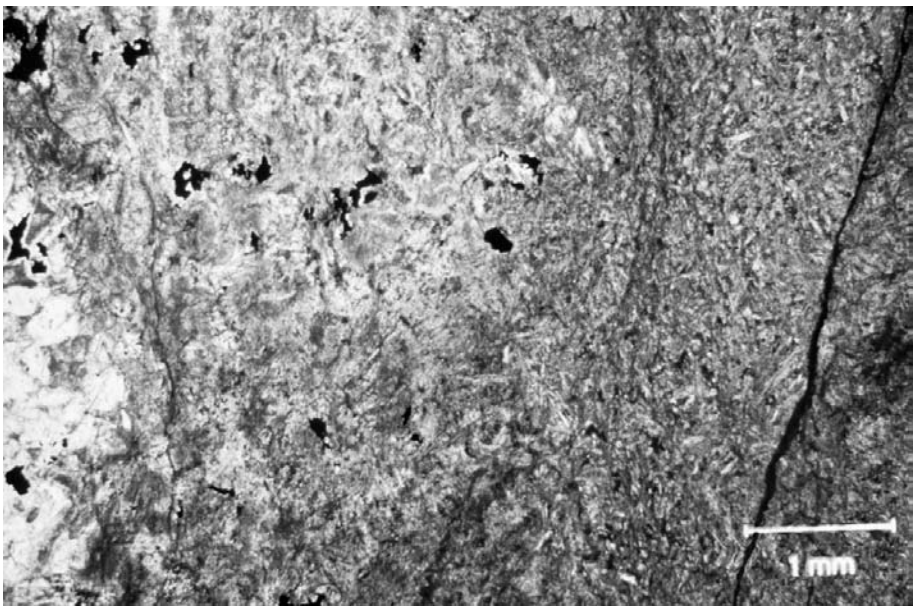

Figure 4. *Photomicrograph of the contact between coarser-grained hanging wall gabbro (left) and the fine-grained pyroxenitic top of Raglan Formation (right) in Fig. 3, showing a hybridized zone between the two units. (DDH# 718-898/139m).*

Davis (1999), Beresford and Cas (2001), and Houlé et al. (this volume) have described minor invasive features at Kambalda and Dundonald, but the magma-sediment interaction observed at Raglan appears to occur on a greater scale. Invasive systems provide a very efficient mechanism for extraction of S from country rocks and therefore for the generation of Ni-Cu-(PGE) mineralization.

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