**Magmatic Ni-Cu-PGE sulphide deposits of the ca. 1.1 Ga Mid-continent Rift, North America**

*Jennifer Smith, Geological Survey of Canada, Ottawa, Canada*

North America's Mid-continent Rift (MCR) represents one of the best-preserved intra-continental rift systems of late Mesoproterozoic age. Magmatic Ni-Cu-PGE deposits of the ca. 1.1 Ga failed rift system occur in association with a diverse range of ultramafic-mafic intrusions, from small early-rift conduits to large layered, mafic intrusions such as the Duluth Complex. The most prospective Ni-Cu-PGE targets (e.g. Eagle, Tamarack) are hosted by small, early-rift (1117 to 1106 Ma), mafic-ultramafic intrusions. These deposits are developed within the magmatic plumping system of the rift, within long-lived magma pathways; an environment known to be favourable for the development of high tenor massive sulphides. These conduit-type intrusions host the bulk of the world's mineable Ni-Cu resources, and as a result remain the focus of much exploration. The 1099±1 Ma Duluth Complex and similar large, sill-like mafic, layered intrusions (e.g. Sonju Lake, Mellen Complex, Echo Lake and Crystal Lake) are known to host Ni-Cu-PGE sulphide mineralization. Although these intrusion types host disseminated sulphides and lower metal concentrations than the likes of Eagle, they remain prospective targets and are favourable settings for the development of stratiform reef-style PGE-Ni-Cu mineralization.

The nature and style of mineralization is variable throughout the ultramafic-mafic intrusions. Some conduit deposits such as Eagle and Tamarack host massive Ni-Cu sulphides, whilst others are relatively S-poor but show extreme PGE enrichment (Current Lake, Marathon Deposit-Coldwell Complex). It is yet to be determined whether distinct mineralizing events/styles can be directly related to discrete magmatic episodes, specific primitive melt compositions and/or localized crustal contamination. The main-rift, large mafic intrusions are notably more Cu-rich, characterized by low Ni/Cu ratios (<1) and lower Ni concentrations in olivine. Drilling has also revealed that the conduit intrusions exhibit a variety of forms occurring as tubular-shaped chonoliths, vertical/funnel dykes and lenticular/tabular bodies. The geometry of these deposits is thought to be largely controlled by pre-existing crustal structures.

The Targeted Geoscience Initiative (TGI) [Hope I have what TGI stands for correct!]] research aims to address the processes that are fundamental for metal enrichment within the MCR and how these may vary both temporally and spatially during the rift's development. Through obtaining new and improved age constraints across the rift, we eventually aim to resolve and untangle the key processes relating to the rift's evolution. Furthermore, with the rift also host to numerous unmineralized mafic-ultramafic intrusions, the large-scale controls on metal endowment and distribution can be fully investigated.