

Metallogeny and Tectonic Evolution of the Trans-Hudson Orogen

Corrigan, D.

The Canadian Shield is a collage of Archean plates and accreted juvenile arc terranes and sedimentary basins of Proterozoic age that were progressively amalgamated during the interval 2.45 to 1.24 Ga, with the most substantial growth period occurring during the Trans-Hudson orogeny, between ca. 1.90 to 1.80 Ga. The Trans-Hudson is better defined as a composite orogen, culminating with the collision between the Rae/Hearne plate, the Superior Craton, and a number of smaller intervening Archean-age plates such as the Sask and Meta-Incognita microcontinents. Preservation (or not) of juvenile crust, and hence of Paleoproterozoic-age mineral deposits, was strongly influenced by the architecture of the more rigid, colliding Archean lithospheric plates. Juvenile Paleoproterozoic crust is in large part preserved in structural klippe overlying Archean craton margins, in plate re-entrants, or in areas dominated by regional transcurrent or transpressional stress fields.

From a metallogenic perspective, the Trans-Hudson orogen is comparatively fertile, hosting world-class VMS and magmatic nickel deposits, as well as containing the largest Proterozoic-age gold deposit in Canada (New Britannia). Economic VMS deposits are preferentially located in the western Reindeer Zone in Saskatchewan and Manitoba where a larger volume of juvenile arc and oceanic crust is preserved. Their preservation at relatively low metamorphic pressures and temperatures, especially in the Flin Flon Belt, is somewhat unique for the Trans-Hudson orogen but can be explained by either: i) limited degrees of convergence between the Hearne and Sask plates, or ii) predominance of a transpressional stress regime during subsequent docking of the Superior plate, or a combination of both.

Magmatic Ni-Cu ± PGE deposits occur in at least two distinct tectonic settings that include: i) rifted Archean continental margin (e.g., Thompson, Raglan) and ii) successor arc mafic to ultramafic plutons (e.g., Lynn Lake, Namew Lake). Recently completed tectonostratigraphic and tracer isotope studies in the Superior Boundary Zone suggest that an active geodynamic model, perhaps an ensialic back-arc basin, may be favoured over a mantle plume model for the generation of nickel-hosting mafic-ultramafic suites.

Gold deposits occur in three different settings, which in order of decreasing economic importance are: i) Homestake-type, iron-formation hosted gold, ii) gold associated with VMS deposits, and iii) structural or 'orogenic' gold. The apparent persistence of Archean-age lower crust and sub-continental mantle lithosphere beneath Paleoproterozoic juvenile terranes suggests that at least some portions of Paleoproterozoic orogens should not be ruled out as areas of prospectivity for diamonds.