Highlights of the Western Churchill Metallogeny Project (WCMP)
Bedrock geology compilation and Regional synthesis subcomponent
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Abstract

The Western Churchill Metallogeny Project (WCMP) is a multidisciplinary, multi-agency project undertaken under the auspices of the Northern Resources Development Program (2003-2007), Earth Sciences Sector, Natural Resources Canada. One of the objectives of the WCMP is to publish an integrated, comprehensive, geological and metallogenic synthesis of the Western Churchill Province, in digital format, in order to provide an improved tectonostratigraphic framework for mineral exploration strategies. The region, extending from 60° to 68°N and from 90°-102°W and spanning parts of five provinces and territories, is host to a variety of economic mineral prospects including diamonds, volcanic-associated massive sulphide, magmatic Ni-Cu-PGEs, iron-formation-hosted gold, carving-stone, polymetallic Sedex deposits, and uranium.

This preliminary bedrock geology compilation highlights the types of geological datasets to be included in the new bedrock geology compilation and synthesis of the Western Churchill Province. This interim product covers selected portions of the northwestern and central Hearne subdomains, situated south and east of the Snowbird Tectonic zone.

The MacQuoid-Gibson-Chesterfield Inlet region of the northwestern Hearne subdomain is broadly divided into three lithological and structural subdomains: (1) the MacQuoid Homocline comprised of northwest-dipping belts principally composed of Archean amphibolite facies sedimentary rocks and gneissic tonalite, structurally overlain by (2) a volcanic belt comprised of ca. 2720-2655 Ma, amphibolite facies juvenile mafic, intermediate, and felsic volcanic rocks and associated ca. 2784-2655 Ma plutonic rocks; and (3) the ca. 2700 Ma Cross Bay plutonic complex comprised of polydeformed and metamorphosed Archean tonalite gneiss, diorite and gabbro that structurally overlies the MacQuoid Homocline. The volcanic rocks are predominantly tholeiitic basalts to basaltic andesites. U-Pb isotopic studies from the supracrustal and granitoid rocks suggest that the Cross Bay complex was deformed at ca. 2695 Ma before the onset of ca. 2680 Ma volcanism in the MacQuoid homocline, and highlight a complex Archean and Paleoproterozoic tectono-magmatic evolution. The Big lake shear zone (Blsz), which coincides with the southern margin of the Cross Bay plutonic complex, is a north-dipping zone of straight gneisses/mylonites predominantly derived from granitoid protoliths. Metamorphosed and deformed ca. 2190 Ma mafic dykes, and variably deformed ca. 1830 Ma granite and co-magmatic lamprophyre dyke-swarms represent Paleoproterozoic magmatic events. The region experienced tectonometamorphic events at ca. 2.55-2.5, 1.9, 1.83, and 1.75 Ga.

In the central Hearne subdomain, the Kaminak-Tavani-Marble Island region is underlain by the central and eastern segments of the Rankin-Ennadai granite-greenstone belt, and by Paleoproterozoic continental clastic sequences (e.g., Hurwitz Group) and ca. 1830 Ma granitoid plutons. Geochronological data indicate formation of the Archean crust between 2711-2667 Ma. The oldest volcanic rocks (2711-2691 Ma) consist of mixed tholeiitic and calc-alkaline mafic and felsic, submarine to subaerial volcanic rocks and associated plutons. Younger volcanic rocks and associated calc-alkaline intrusions yield ages between 2686-2679 Ma. A regional, penetrative deformation and metamorphism occurred during the latter stages of a plutonic event at ca. 2680 Ma. Detrital zircon geochronology indicate that the Archean metasedimentary rocks and associated iron formation were deposited after 2681 Ma followed by ca. 2666 Ma post-tectonic granite, ca. 2659 Ma carbonatite, and deposition of post-2660 Ma, possible “Timiskiming-type” conglomerates. Development of the Rankin-Ennadai belt in an extensional, oceanic supra-subduction environment is suggested.

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