

Timing and Linkage of the Mesoproterozoic Ree-Y-Zr-Nb Mineralized Strange Lake and Flowers River Deposits to the Neoproterozoic Nekuashu-Aucoin Magmatic Event, Northern Canada

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The subcircular Mesoproterozoic Strange Lake Peralkaline Complex (SLPC: 1240±2 Ma) is a rare-metal-enriched (Nb-Zr-REE-Yb-Be) multi-phase intrusion that occurs near the Nekuashu Suite and transects the Pelland Suite within the Mistinibi-Raude Block (MRB) of the southwestern Churchill Province (Quebec and Labrador, Canada). The Flowers River Igneous Suite (FRIS: 1281±3 Ma) comprises several discrete peralkaline ring intrusions and coeval volcanic rocks, also enriched in REEs and rare elements, and intrudes the Aucoin Complex in the Nain Province in Labrador. Although the SLPC and FRIS have attracted considerable economic interest and have been the target of numerous detailed studies since the mid-1980s, lingering questions on their overall tectonomagmatic setting and source of metal endowment remain.

Our new crystallization age of 2551±8 Ma (SHRIMP U-Pb zircon) for the Nekuashu Suite broadly coincides with the emplacement age of the Pelland Suite (re-evaluated age of 2519±35 Ma), the Aucoin Complex (2573±8 Ma, 2580±8 Ma, and 2567±4 Ma), and the newly identified Mikuasheunipi Complex (2569±4 Ma). These findings suggest a regional igneous event that is larger than previously recognised, herein termed the Nekuashu-Aucoin event (ca. 2.58–2.52 Ga). All Nekuashu-Aucoin intrusions are characterized by alkaline to calc-alkaline, quartz-poor to quartz-absent, but mostly high-temperature rocks that range in composition from ultramafic to mafic, intermediate, and to a lesser extent, felsic.

Given the close spatial relationship between the SLPC and the MRB, and the FRIS and the Aucoin Complex, we propose that these Late Neoproterozoic intrusions generated from a hydrous metasomatized mantle source that may have acted as a precursor REE enrichment event. Subsequent remelting/reworking processes associated with additional plume-related magmatism and/or far-field tectonic activities/orogeny likely caused the later Mesoproterozoic, rare-metal-enriched peralkaline magmatism of the SLPC and FRIS.