

Tectonomagmatic evolution of the northwest Reindeer zone, Trans-Hudson orogen, Reindeer Lake, Saskatchewan

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The Trans-Hudson orogen is a major Early Proterozoic suture between the Archean Rae-Hearne and Superior cratons of the western Churchill Province. Reindeer Lake transects a major portion of the Trans-Hudson orogen in northern Saskatchewan (northwest Reindeer zone). Exposed from north to south are: (1) reworked Archean crystalline basement; (2) a continental arc batholith (Wathaman Batholith); and (3) a mainly juvenile volcanic arc terrane (La Ronge Domain).

La Ronge Domain metavolcanic rocks (1910 - 1880 Ma) are characterized by arc type geochemical signatures. Compositions are dominantly mafic to intermediate, ranging from low-K tholeiitic to medium/high-K calc-alkaline series types. Nd isotopic data from the metavolcanic rocks indicates a predominantly depleted mantle source region, having $\epsilon\text{-Nd}$ values ranging from approximately +2.5 to +5. A series of banded dioritic to granitic orthogneiss dated at 1890 Ma are coeval with the metavolcanic rocks and also have juvenile $\epsilon\text{-Nd}$ signatures ($\approx +4$).

The Wathaman Batholith (1860 - 1850 Ma) is a calc-alkaline continental arc batholith ranging in composition from gabbro to granite, although it is mostly composed of coarse grained to K-feldspar porphyritic-megacrystic, hornblende-biotite granodiorite. Nd isotopic compositions range from mantle-like values ($\epsilon\text{-Nd} \approx +3$) for mafic rocks to values as low as $\epsilon\text{-Nd} \approx -5$ for more granitic compositions. The data are consistent with bulk mixing between mantle and crust, probably focussed at the crust-mantle boundary or within the lower crust. A correlation between decreasing $\epsilon\text{-Nd}$ (≈ -2 to -5) and increased fractionation within the suite is best explained by mid-crustal (current exposed emplacement depth) assimilation and fractional crystallization processes. An increased crustal component to the magmas formed in the northern portion of the batholith can be seen in the major and trace element geochemistry. As the exposed Archean basement is approached, the relative abundances of some low

field strength elements (K, Rb, Ce, total REE and Pb) as well as high field strength elements (Y, Nb, Zr and Th) increase, indicating a larger crustal component to the magmas.

Plutons within the La Ronge Domain group mainly within the 1860 - 1846 Ma age range and are thus predominantly coeval with the emplacement of the Wathaman Batholith. On Reindeer Lake plutons range in composition from diorite to granite, although quartz diorites, tonalites and granodiorites predominate. Geochemical data are consistent with a volcanic

arc source for the plutons. Nd isotopes range from mantle like values ($\epsilon\text{-Nd} \approx +5$) to values as low as $\epsilon\text{-Nd} \approx -4$, indicating a significant older crustal component to some magmas. Based on field relationships and geochronological data it is believed that many of these plutons are related to the Wathaman Batholith with differences in chemical and isotopic properties due to their emplacement predominantly within the accreted arc terranes.