

# Geochemistry and Geochronology of ca. 1460 Ma large Igneous Province Mafic Magmatism of the Laurentian Craton: Characterization of Underlying Plume and Lithosphere Activity

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## Abstract

Mesoproterozoic (ca. 1460 Ma) magmatism (mainly mafic dykes and sills) that are exposed on the eastern and western margins of Laurentia (North America) are each interpreted to be parts of a Large Igneous Province (LIP): the magmatism of the western margin (British Columbia, Montana, Idaho and Colorado), and that of the eastern margin (Labrador) are herein labelled the Western Laurentia Node (WLN) and the Eastern Laurentia Node (ELN), respectively. LIPs are identified as intraplate magmatism that consists of large volumes of magma ( $>0.1\text{Mkm}^3$ ) emplaced in a very short period of time ( $<1\text{-}5\text{Ma}$ ) over a large area ( $>0.1\text{Mkm}^2$ ). The WLN contains the gabbroic Moyie sills of the Belt-Purcell basin that are associated with a number of mineral deposits including the world class Sullivan Pb-Zn deposit. Dykes in the Wyoming craton are also linked with the WLN. The ELN consists of the non-mineralized Michael-Shabogamo Gabbros. The goals of this project are to geochemically and isotopically: 1) characterize and model the ca. 1460 Ma magmatism of each node in terms of source and subsequent differentiation processes, 2) develop criteria to distinguish ca. 1460 Ma units of the WLN from intermixed swarms of different ages (including dykes of the 780 Ma Gunbarrel LIP) 3) compare the petrogenesis of the two nodes of ca. 1460 Ma magmatism to test three hypotheses for their origin: *i*) a single superplume model, *ii*) multiple plume model or *iii*) variable tectonic setting model that include a different origin of magmatism for each node, including one or more of the following: *a*) plume, *b*) subduction-back arc, and/or *c*) intra-continental rift basins. To assess the plausibility and/or validity of each of these hypotheses the following questions will be addressed: *i*) what geochemical variations exist within and among each ca. 1460 Ma node? *ii*) What is the origin (source, tectonic setting) of the mafic magmatism?