

Paleoproterozoic Svecofennian orogeny –rapid crustal growth on the margin of the Columbia supercontinent

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Formation of the continental crust and its destruction are mainly related to plate tectonic processes in subduction zones. The Central Finland Granitoid Complex (CFGC) composed mainly of plutonic rocks varying compositionally from diorites to granites is the Paleoproterozoic core of the Svecofennian orogeny. Large granitoid batholiths and complexes such as the CFGC are formed by numerous smaller plutons and intrusions representing magma pulses from variable source depths. U-Pb geochronological data supports rapid crustal growth progresses at 1.90–1.87 Ga for the CFGC. The radiogenic isotope fingerprints of the plutonic rocks from the CFGC point towards a source with relatively short crustal residence time. Both Lu-Hf in zircon data ($\epsilon_{(Hf)}$ -8–9), and whole-rock Sm-Nd data ($\epsilon_{(Nd)}$ -1.7–2.5) exclude significant input from Archean reservoirs.

As a whole, isotopic and geochemical evidence from CFGC point to rapid crustal growth during the Svecofennian orogeny in a maturing arc setting at 1.90–1.87 Ga, preceded and postdated by assembly of island arcs. In larger scale the Svecofennian orogeny was a part of the external margin of the Paleoproterozoic supercontinent Columbia (Nuna) during its assembly. Compared to the CFGC the other major Paleoproterozoic granitoid complex of the Fennoscandia, Central Lapland Granitoid Complex (2.1–1.78 Ga), formed during the Lapland-Kola is based on radiogenic isotopes characterized by longer crustal residence times and clear contribution from Archean crust. This indicates that the Central Lapland Granitoid Complex was positioned further away from the Columbia supercontinent's margin whereas Svecofennian orogeny was located along the external margin in position that allowed accretion of island arcs.