

Isotopic evidence from crustal growth during the Svecofennian orogeny – a study from the Central Finland Granitoid Complex

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The Paleoproterozoic Svecofennian Province is a part of the Fennoscandian Shield extending from Central Finland and Sweden southeast to Estonia and Russia in the southeast along the southern boundary of the Archean Karelia Province. The Central Finland Granitoid Complex (CFGC) is the core of the Svecofennian Province composed mainly of plutonic rocks varying compositionally from diorites to granodiorites and granites. At outcrops mixing and mingling textures, synplutonic dykes, and mafic magmatic enclaves highlight the simultaneous nature of mafic, mantle derived magmatism and more evolved felsic magmatism in the CFGC (Mikkola et al. 2018).

The mainly calc-alkaline CFGC plutonic rocks have been emplaced between 1.90 and 1.87 Ga, based on U-Pb geochronological data indicating relatively fast crustal growth. Both whole-rock Sm-Nd ($\epsilon_{Nd} -1.7$ – $+2.5$) and Lu-Hf ($\epsilon_{Hf} -8$ – $+9$) from zircons point towards relatively juvenile sources for the plutonic rocks without involvement of Archean crustal component (Heilimo et al. 2023). As a whole, isotopic evidence and geochemical characteristics (Heilimo et al. 2018) collectively points to crustal growth with maturing arc characteristics at 1.90–1.87 Ga. A possible scenario would be amalgamation of island arcs during the Svecofennian orogeny. The maturing arc characteristics fits in a larger scale to the proposed Great Proterozoic Accretionary Orogen (e.g. Condie 2013) resulting in formation of the supercontinent Nuna (Columbia). We propose that 1.9 Ga ago the CFGC was part of the active margin of the Great Proterozoic Accretionary Orogen.

References

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