Multistage and long duration of magmatic activity is a new paradigm for origin of paleoproterozoic PGE layered intrusion of the Arctic region (Fennoscandian Shield)

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Paleoproterozoic PGE layered mafic-ultramafic intrusions are widespread in the N-E part of Fennoscandian Shield and belong to two belt: North (Kola) and South (Finland and Karelia). Precise isotope-geochemical data using U-Pb (on single zircon and baddeleyite) and Sm-Nd (rock-forming and sulfides minerals), systematic reflect long magmatic activity (with 2.53, 2.50, 2.45, 2.40 pulses) and duration of plume mantle event from 2.53 to 2.40 Ga.

In the Kola belt barren phases were dated in Fedorovo-Pansky massif with 2.53 Ga for orthopyroxenites and olivine gabbro. Main PGE-bearing phases of gabbronorite (Mt. Generalskaya), norite (Monchepluton) and gabbronorite (Fedorovo-Pansky) massifs have yielded 2.50 Ga on U-Pb and Sm-Nd dating. The next PGE-bearing phases with 2.45 Ga belong to anorthosite of Mt. Generalskaya, Fedorovo-Pansky and Monchetundra intrusions. The same ages have layered PGE-bearing intrusions of Finland – Koitelainen, Penikat et. set. and Oulanga group in Karelia [Alapieti et.al.,1990, Bayanova et al., 2009, 2013]. The final mafic magmatic activity connected with dykes of Imandra lopolith with 2.40 Ga. Isotope geochemical εNd-ISr indicators for layered intrusions reflect enriched mantle EM-1 type reservoir with ISr values from 0.703-0.704. Isotope $^{3}He/^{4}He$ data for accessory minerals (ilmenite, magnetite et. set.) have significant lower and upper mantle contribution. The model Sm-Nd ages of protolith lies in 3.2-2.9 Ga and primary magma source as fertile (FM) according to [Arndt, 2010]. The geological and isotope-geochemistry data for layered paleoproterozoic PGE-intrusions and dykes from OIB,E-MORB and N-MORB reservoirs permit considered Fennoscandian Shield (Arctic region) with Superior and Wyoming as a big magmatic plume LIP, which related with breakup of oldest Kenorland Sypercontitent.

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