

Mantle source of the 2.44-2.50 Ga mantle plume-related magmatism in the Fennoscandian Shield: evidence from Os, Nd and Sr isotope compositions of the Monchepluton and Kemi intrusions

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Wide-spread mafic-ultramafic magmatism occurring in the Fennoscandian Shield at 2.44-2.50 Ga is believed to be related to a mantle plume activity. Earlier work has revealed that most of the intrusions have negative ϵ_{Nd} values of about -1 to -2. One potential explanation is crustal contamination of magma derived from sublithospheric mantle, but another possibility is a metasomatized subcontinental lithospheric mantle. Because the two mantle sources show contrasting Os isotope signatures, we determined Os isotopic compositions of chromite separates from the Monchepluton and Kemi intrusions to constrain the mantle source of the magmatism.

Chromite separates in the Monchepluton show near chondritic γ_{Os} , similar to the Kemi main ore. The constant near chondritic γ_{Os} values, suggest that the magma was derived from a mantle plume source and that the Os isotope composition of the magma was not significantly changed by crustal contamination. On the other hand, some samples from the upper chromite seams of the Kemi intrusion, and most samples from the Koitelainen and Akanvaara intrusions have slightly elevated γ_{Os} values. Modelling of Os and Nd isotope suggests a plume mantle source followed by variable degrees of crustal contamination, also consistent with the slightly elevated Sr isotope composition.