

Field observations and geochemistry of Archaean TTG-metabasalt associations in Arctic Fennoscandia

JAANA HALLA

Finnish Museum of Natural History, University of Helsinki

Presenting Author: jaana.halla@helsinki.fi

During the Archaean, Earth's primitive mantle-derived basaltic crust transformed into a thickening continental TTG (tonalite-trondhjemite-granodiorite) crust. Many Archaean terrains that have survived to this day consist of TTGs with substantial amounts of associated metabasalts, thus they constitute key areas for the study of the early crustal evolution. To shed light on the petrogenesis of the TTG crust, this work presents field observations and geochemical characterisation of Meso- to Neoarchaean TTG-metabasalt associations of the Inari and Rommaeno complexes in Arctic Fennoscandia. Folded and banded TTG gneisses with abundant metabasalt enclaves show migmatite structures that form a closed system of interconnected metatexite-diatexite transitions controlled by melt proportions and syn-anatectic strain. The geochemical results point to a bimodal tonalite-basalt association as well as show the intermingled combination of low- and high-HREE types of TTGs. Heterogeneous mixing of amphibolite-facies water-fluxed melts with dehydration melts migrated from granulite-facies provides a worthwhile hypothesis for the HREE variation in TTGs. In the light of these results, a viable explanation for the origin of the TTG-metabasalt association is a closed-system intracrustal differentiation by *in situ* and in-source partial melting of metabasalts in the deep parts of a thick mafic crust.