ORIGIN AND EVOLUTION OF THE PALEOPROTEROZOIC LAPLAND GRANULITE BELT, BALTIC SHIELD: INTEGRATED RESULTS OF GEOLOGICAL AND PETROLOGICAL STUDIES OF EXPOSED GRANULITES AND DEEP CRUSTAL XENOLITES AND SEISMIC PROFILING

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Metamorphic history of the Lapland granulite belt, that is a constituent of Paleoproterozoic collision orogen in the northeastern Baltic Shield, includes consequence of events: M1 stage (2.42-2.41 Ga, 860-960oC, 10.3-14.0 kbar) is only fixed in the lowest part of the belt; M2 event (1.95-1.92 Ga) is characterized by 800-860oC, 5.8-12.4 kbar; for the most intensive M3 event temperatures 640-770oC at pressures 4.8-10.7 kbar were estimated; conditions of final M4 stage (1.90-1.88 Ga) are 550-650oC, 4.5-8.4 kbar. Rapid overriding by hot tectonic slices during M4 stage resulted in origin of inverted metamorphic zoning in the autochthonous rocks and subsidence of thickened crust. Lower crustal xenolites lifted by Devonian dykes include mafic granulites with age record similar to metamorphic history of Lapland granulitic assemblages. P-T estimates in most of granulite samples range from 820oC and 12 kbar to 950oC and 17 kbar extending M2 parameters of the Lapland granulites toward more high-grade conditions. Thermal gradient within lower crust during granulite metamorphism of M2, M3 and M4 events was less than 5oC/km. Reflection seismics and geological mapping evidence thrust structure of the belt. Thickness estimates of the LGB ensemble as a whole and of individual slices obtained from geological-geophysical and petrological data are in good agreement. Above date provide an indication of tectonic decoupling of the continental crust during Paleoproterozoic collision. Crustal slice approximately 40 km thick was separated and upthrusted as the lowest crustal rocks (at 40-60 km depth) were preserved at the original position. Some rocks of mid-upper crust levels occurred sandwiched between lower crust and the Lapland thrust ensemble.