MATHEMATICAL SIMULATION OF THE LAPLAND GRANULITE BELT FORMATION: INTRACRUSTAL OBDUCTION AND COLLISION WITHOUT OROGENY

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On the basis of geological-geophysical data interpretation and mathe-matical modeling, the geodynamic regimes responsible for the formation of the Lapland Granulite Belt (NE Baltic Shield) located at the conjunc-tion between crustal megablocks were reconstructed and a possibility of intracrustal obduction and the formation of large collision structure without orogeny was shown. Below the granulite nappes, waveguides and isotropic non-laminated volumes are detected by vibroseismic sounding. Seismic data suggest that there existed a ductile rock layer beneath the megablocks in the conjunction zone. Numerical modeling resulted in as follows. Megablock underthrust causes excess heating of the ductile lower-crustal rocks. In the conjunction zone the heating may reach 300-400°C per 10 mln. years of collision. The sliding blocks impulses were short and discrete. Simultaneously, hyperpressure could arise in the ductile zones below and at junction of mobile geoblocks that caused uplifting of lower crust rocks to the surface. A backward mass flow effect arose in the ductile layer beneath moving rigid megablocks under certain relationships between parameters of the geodynamic process, as well as in the ductile layer situated in the junction zone between the megablocks. At certain regimes the upper crust rocks could be removed to the lower crust level. Beneath the moving megablocks the ductile rock flow had both a downward tendency resulting in an erosion of the bottom of the upper rigid granite-gneissic layer and an ascending tendency causing an injection of viscous streams into the interblock and producing an excess pressure that elevated granulite lenses from the bottom of the rigid crustal layer up to the upper level. Thus, mountain folding in the upper crust level was compensated by lateral mass flow in the crust asthenolens.