



## **Reconstruction of the ancient zones of stress relaxation in the Earth's crust of the north-eastern Baltic Shield.**

Valentina Filatova

Geological Institute of the Kola Science Center of the RAS, Apatity, Russian Federation (filatova@geoksc.apatity.ru)

The research has been carried out on the basis of numerical simulation to reconstruct zones of high permeability of the basement, which formed in the Early Precambrian and determined the localization of tectonic and magmatic processes in the region. The study region is treated as a non-uniform elastic body affected by volume forces and stresses specified at the boundary. Three stages of the region development have been studied: (a) 3.0-2.8 Ga; (b) 2.8 - 2.5 Ga; (c) 2.5-1.6 Ga. At each stage a base model has been set. Every model describes the studied region in terms of geological structures formed by this time. Linear-elastic constants for rocks and direction of the compressive forces were specified in accordance with the available data. Performed investigation allowed to estimate stress values which could occur in the continental plate of the northeastern Baltic Shield by external tectonic forces. Quantitative models of the stress and strain state of the regional Earth's crust have been constructed with due regard of its evolution. It is proposed to apply calculations of maximum shear stress when identifying weak zones. The permeable zones of the crust are marked by anomalous values of shear stresses. Almost all tracing zones coincide with the areas, where tectonic and magmatic processes have performed. All marked zones are correlated with the known Archaean and Proterozoic and Palaeozoic geologic structures. The obtained results revealed a location heredity of magma feeding channels in the region from the Archaean up to the Early Proterozoic and Palaeozoic. Thus, the stress and strain state could affect the character of the geodynamic processes that determined the development of the mobile-permeable zones within the rigid blocks. The carried out investigation pioneers quantitative estimates and interrelation of geodynamic factors interpreting formation mechanisms of the deformed structures in the region. The obtained results give grounds to revise the existing concepts about the mechanism of the Earth's crust formation in the north-eastern Baltic Shield. The elaborated methods can be applied for fast diagnosis to allocate weakened zones in the basement and evaluate their permeability degree with the minimum time and resources required.