Geophysical Research Abstracts
Vol. 14, EGU2012-2438, 2012
EGU General Assembly 2012

4-D model of the Archaean crustal evolution of the Fennoscandian Shield based on geological data

A. Slabunov
Institute of Geology, Karelian Research Centre, RAS, Petrozavodsk, Russian Federation (slabunov@krc.karelia.ru)

The Fennoscandian Shield (FS), together with the Canadian Shield (Percival, 2010), has been thoroughly studied geologically, geochronologically and geophysically and can, therefore, be used as testing grounds for developing 4-D models of the evolution of the Early Precambrian Earth's crust.
A 4-D model is the result of the integrated interpretation of geological evidence. In this paper a model of crust formation in Archaean time (3.1-2.6 Ga) is presented. It was developed using: 1) isotopic geochronological data for correlating of geological events in different structures (terrains); 2) data on the compositional characteristics of complexes for assessing geodynamic settings in which they were formed; 3) geophysical (especially seismic) data to understand the deep structure of the Earth's crust and, correspondingly, the relationship of terrains.
The eastern FS consists dominantly of Archean bedrock that can be divided into the Karelian, Murmansk, Belomorian, Kola, and Norrbotten provinces, each having a distinct crustal growth and subsequent reworking history (Hölttä et al., 2008). The Karelian Craton and the Kola Province fall into relatively large terrains that differ in the age and composition of their rock constituents.
The FS is split up into three fragments of the Palaeoarchean (3.5-3.2 Ga) continental crust that presumably existed as one microcontinent. About 3.1 Ga ago it obviously broke up.
Ca.3.05 Ga ago a new growth cycle of the continental crust began. During the 3.05-2.95 Ga period the crust was forming by subduction and subsequent accretion to the largest old Vodlozero block. Mantle-plume magmatism manifests itself in the central part of the block.
The bulk of the Archaean continental crust of the FS was formed during the 2.95-2.82 Ga period. Fragments of island-arc volcanics and ophiolite-like eclogites have been encountered, for example, in the Belomorian Province. Felsic adakite- and calc-alkaline-series volcanics of this age are known to occur in the greenstone belts of the Vodlozero terrain. The basic continental crust-forming geodynamics is provided by subduction-accretion processes.
These processes also dominated over the 2.78-2.72 Ga period when island-arc volcanics and intrusives, as well as eclogites and suprasubduction ophiolites, were also produced.
During the 2.72-2.58 Ga period collision and postcollision processes took place in the central part of the continent. The Belomorian Province is the core of the collisional orogen, and accretion processes continued north and south of the core of the orogen.
2.5 Ga ago, rift formation marked the beginning of a new cycle in the lithospheric evolution of the FS. In the preceding period (2.58-2.5 Ga) endogenous activity faded out.
The duration of formation of the continental crust in the eastern FS in Meso-Neoarchaean time and its main stages is comparable to their duration in the classical Wilson cycle.
This is a contribution to RFBR Project 11-05-00168 a

References

Hölttä P., Balagansky V., Garde A., Mertanen S., Peltonen P., Slabunov A., Sorjonen-Ward P., Whitehouse M. 2008. Episodes. 31 (1). 13-19.
Percival J.A., 2010. Fifth International Archaean Symposium. Abstracts. Record 2010/18. Perth. 145-147.