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A 4-D model of the Archaean Crustal Evolution of the Fennoscandian Shield

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The main methods used for the construction of a 4D model are correlation of geological processes [5] and, if available, palaeomagnetic data [3]. The eastern Fennoscandian Shield (FS) consists dominantly of Archean bedrock that can be divided into the Karelian, Murmansk, Belomorian, Kola, and Norrbotten provinces [1, 5]. The FS is split up into three fragments of the Palaeoarchean (3.5–3.2 Ga) continental crust that presumably existed as one microcontinent [1, 5]. About 3.1 Ga ago it 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 and within the surrounding ocean. The bulk of the Archaean continental crust of the Fennoscandian Shield was formed during the 2.95–2.82 Ga period. Fragments of island-arc volcanics, ophiolites and eclogites [4, 5] have been encountered in the Fennoscandian Shield. Moreover, ca. 2.88–2.82 Ga oceanic formation of Serik-type, island-arc volcanics of the Keret greenstone belt (GB), metagraywacke (front-arc basin sediments) of the Chupa paragneiss belt, Salma eclogites [4, 6, 7] were formed in the Belomorian province. They mark the subduction boundary of the lithospheric plates. The main 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, eclogites [2.9] and suprasubduction ophiolites were also produced [5, 7]. It should be stressed that island-arc volcanics (Kichany GB) and granulites were derived in the suprasubduction zone in the Belomorian province simultaneously with the Neoarchean eclogites formed in the subducting slab. Thus, a set of complexes that mark the subduction persists here [7], and a short continental subduction episode stands out.

During the 2.71–2.58 Ga period collision and postcollision processes took place. The Belomorian province is the core of the collisional orogen [5, 6, 8], where nappe-fold tectonics, kyanite-subfacies metamorphism, partial rock melting and granitic magmatism occurred [1, 6, 8]. The duration and stepwise pattern of formation of the early continental crust of the FS in the Meso- and Neoarchean are correlatable with those in the classical Wilson cycle.

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