



Archaean associations of volcanics, granulites and eclogites of the Belomorian province, Fennoscandian Shield and its geodynamic interpretation

Alexander Slabunov

Russian Federation (sl062@mail.ru)

An assembly of igneous (TTG-granitoids and S-type leucogranites and calc-alkaline-, tholeiite-, komatiite-, boninite- and adakite-series metavolcanics) and metamorphic (eclogite-, moderate-pressure (MP) granulite- and MP amphibolite-facies rocks) complexes, strikingly complete for Archaean structures, is preserved in the Belomorian province of the Fennoscandian Shield.

At least four Meso-Neoarchaean different-aged (2.88-2.82; 2.81-2.78; ca. 2.75 and 2.735-2.72 Ga) calc-alkaline and adakitic subduction-type volcanics were identified as part of greenstone belts in the Belomorian province (Slabunov, 2008). 2.88-2.82 and ca. 2.78 Ga fore-arc type graywacke units were identified in this province too (Bibikova et al., 2001; Mil'kevich et al., 2007). Ca.2.7 Ga volcanics were generated in extension structures which arose upon the collapse of an orogen. The occurrence of basalt-komatiite complexes, formed in most greenstone belts in oceanic plateau settings under the influence of mantle plumes, shows the abundance of these rocks in subducting oceanic slabs.

Multiple (2.82-2.79; 2.78-2.76; 2.73-2.72; 2.69-2.64 Ga) granulite-facies moderate-pressure metamorphic events were identified in the Belomorian province (Volodichev, 1990; Slabunov et al., 2006). The earliest (2.82-2.79 Ga) event is presumably associated with accretionary processes upon the formation of an old continental crust block. Two other events (2.78-2.76; 2.73-2.72 Ga) are understood as metamorphic processes in suprasubduction setting. Late locally active metamorphism is attributed to the emplacement of mafic intrusions upon orogen collapse.

Three groups of crustal eclogites with different age were identified in the Belomorian province: Mesoarchaean (2.88-2.86 and 2.82-2.80 Ga) eclogites formed from MORB and oceanic plateau type basalts and oceanic high-Mg rocks (Mints et al., 2011; Shchipansky et al., 2012); Neoarchaean (2.72 Ga) eclogites formed from MORB and oceanic plateau type basalts. The formation of eclogites is attributed to processes in a subducting slab.

Correlation of the above complexes has revealed four alternating subduction systems: 2.88-2.82 Ga which comprises both suprasubduction (island-arc volcanics, graywackes) complexes and those from a subduction slab (eclogites), 2.81 [U+F02D] 2.78 Ga - island-arc volcanics, graywackes, granulites and eclogites; 2.75 Ga - island-arc volcanics only; 2.73-2.72 Ga - island-arc volcanics, granulites and eclogites.

The duration of functioning of Meso-Neoarchaean subduction systems varies from 60 (or probably 30) to 15 Ma, which is consistent with the results of the numerical modelling (van Hunen, 2001) of subduction at mantle temperatures 125-150 degrees higher than the present temperature.

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