Geophysical Research Abstracts
Vol. 21, EGU2019-947-1, 2019
EGU General Assembly 2019

Tracking the 1.86-1.84 Ga continental margin in the concealed basement of Lithuania, western East European Craton: implications from U-Pb, Sm-Nd and Rb-Sr isotopic investigations

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The crystalline basement of Lithuania in the western East European Craton (EEC) is covered by 200-1000 m thick Phanerozoic sediments and known only though drillings and geophysics. The 1.86-1.84 Ga Randamonys complex in southern Lithuania, consisting of metamorphosed granodiorite, diorites and gabbros, and similar rocks in neighbouring Belarus were considered by Bogdanova et al (2015) to be a part of the Mid-Lithuanian domain (MLD), and evidence of a continental margin established by that time. It was assumed to continue to the northwest through central and western Lithuania to the Baltic Sea and merge with the 1.87–1.84 Ga Askersund-Loftahammar plutons to the south of Bergslagen in Sweden (cf. Stephens et al., 2009). Different metamorphic grades of the studied rocks, reaching granulite facies in the west and amphibolite in the south, was reported by Skridlaite et al. (2014).

In order to track the MLD's continuation to the west, zircons from two samples of metamorphosed igneous rocks (St87/1158.5 and Vd62/1665) were dated at the NORDSIM facility and Sm-Nd and Rb-Sr isotopes from the six MLD samples (268/436.3, 346/563.4, 347/342.8, 62/1665, 26/1763, 99/1218.3) were investigated at the Swedish Museum of Natural History in Stockholm. Both the dated samples have negative Nb and Ti anomalies in the MORB-normalized spider diagrams, hence, they have subduction-related signatures. They, however, differ in REE patterns (chondrite-normalised), the St87 having a flatter slope and being less fractionated than the Vd62. Both rocks have yielded similar U-Pb ages: Vd62 of 1849±8 Ma and St87 of 1843±9 Ma.

The revised previous and newly obtained chemical and isotopic data has revealed some heterogeneities in the southern and western MLD. The western MLD rocks are mostly tholeiitic, richer in potassium, LILE and REE, have higher initial $^{87}Sr/^{86}Sr$ ratio and negative $\varepsilon Nd_{1.84Ga}$. The southern MLD rocks are calc-alkaline, have a low Na/K ratio, initial $^{87}Sr/^{86}Sr$ ratio close to that of the depleted mantle, as well as positive $\varepsilon Nd_{1.84Ga}$. In an Y vs Sr/Y diagram, the western MLD rocks plot in a normal calc-alkaline field, while most of the rocks from southern MLD display a strong adakite-like signature.

To sum up, the newly dated rocks confirm the continuation of the MLD westwards and its possible correlation with the similar-aged complexes in south-central Sweden. The recent geochemical and isotopic study of the 1.86-1.84 Ga rocks has revealed heterogeneities of the melt-generation source along a former subduction zone. The rocks from the western MLD have a strong EMII signature, that may indicate a presence of subcontinental mantle or continental crust. The southern MLD rocks have been derived mainly from a depleted source and show little contamination by crustal components.

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