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C. 1.5 Ga metamorphism of the Lazdijai 13 volcano-sedimentary sequence in southern Lithuania: its origin and implications

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The concealed crystalline crust in the SW East European Craton consists of several domains finally accreted at 1.8-1.70 Ga (Bogdanova et al., 2014). However, some geological structures in the Lithuanian basement are still poorly reconstructed because of insufficient isotopic and geochemical data. Such is the Lazdijai 13 (Lz13) volcano-sedimentary sequence in southern Lithuania, preliminary dated at 1.83-1.80 Ga (U-Pb zircon age). The newly obtained monazite analyses (EPMA dating, Cameca SX-100 electron microprobe, Warsaw University) allowed dating of metamorphism of the Lz13 rocks.

The 300 m thick Lz13 sequence is composed of deformed and metamorphosed volcanics, volcano-clastics and sediments, cross-cut by pegmatite and quartz veins. The upper part of the drilling (at c. 493 m) consists of exhalitic quartz chlorite cherts and metaandesitic rocks. They are underlain by medium-fine grained shists composed of quartz, biotite, garnet, cordierite, staurolite, minor plagioclase, K-feldspar, magnetite and monazite (felsic volcanics, 540 m) that were metamorphosed at 580° C and 6 kbar (garnet, biotite, cordierite geothermobarometry). Monazites are small, interstitial, fragmented and dissolved, some found as inclusions in magnetite. They yielded three ages: 1685±25 Ma, 1525±11Ma, and 1448±24 Ma. Another layer of a fine grained shist (quartz, biotite, garnet, K-feldspar, muscovite, 599 m) of sedimentary origin contains zircons and monazites arranged in thin, undulating lines. The monazites are small, interstitial, partly dissolved, in places overgrown by alanite aggregates. They yielded 1671±29 Ma and 1523±17 Ma ages. Below, at 757 m, a strongly deformed shist composed of quartz, biotite, K-feldspar, plagioclase, garnet and cordierite (former sediment) was metamorphosed at 498° C and 5.4 kbar (garnet, biotite, plagioclase and muscovite geothermobarometry). It contains very small, strongly dissolved and locally overgrown by alanite, monazite grains. Three of them were dated at 1629±48 Ma and 1499±21 Ma.

The 1685-1629 Ma ages were obtained from relic domains in the c 1.5 Ga monazites. These domains might be the relics of magmatic monazites, somewhat older than 1.69 Ga. The largest monazite group of c. 1530-1500 Ma seems to record a major metamorphic event. The c. 1450 Ma age might indicate a cooling or lead loss as in case of the oldest monazites.

According to the previously obtained data, the volcano-sedimentary sequence of Lz13 might have been formed in a back arc tectonic setting c. 1.83-1.80 Ga ago. The new data shows that the rocks did not experience any stronger metamorphic reworking until c. 1.5 Ga. The nearby AMCG charnockites and host rocks were metamorphosed at 1.53-1.50 Ga (Skridlaite et al., 2008). The metamorphism might have been caused by the intrusion of the 1.54–1.50 Ga AMCG Mazury suite in N Poland and S Lithuania. The Mesoproterozoic AMCG magmatism and metamorphism in Lithuania as well as in Poland may be regarded as inboard manifestations of the accretionary Danopolonian orogeny (Bogdanova, 2008) at the present southern margin of ProtoBaltica.

This is a contribution to the Open Access Centre activities

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