

The 1.83-1.80 Ga volcano sedimentary sequence in southern Lithuania: origin, evolution and correlation with south-central Sweden

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The concealed crystalline crust in the SW East European Craton consists of several domains younging towards present south. Remnants of the c.1.83 Ga volcano-sedimentary sequence are preserved among the 1.86-1.84 Ga magmatic rocks in south-central and southern Lithuania.

The sequence is mainly composed of metamorphosed peraluminous tholeiitic rhyolites and calc-alkaline andesitic volcanics, interlayered with silica-clastic and carbonate sediments, crosscut by pegmatitic granite and quartz veins. The U-Pb zircon ages of c. 1.83 Ga and c. 1.79 Ga from a felsic metavolcanic rock are interpreted to indicate a major volcanic event and a later volcanic contribution respectively. Sm-Nd isotopic data from the same rock yielded TDM = 2.08 Ga age and $\epsilon_{\text{Nd}}(1.83) +1.02$. The rocks have experienced amphibolite facies thermal metamorphism of 650°-570° C and 4.5 kbar at 1.53-1.50 Ga as was implied from the EPMA chemical dating of monazites. Redox conditions were estimated using the magnetite-ilmenite geothermobarometry (Lindsley and Spencer, 1982), which yielded 405° C temperature and -35 log(f_{O_2}) oxygen fugacity.

The available geochemical data, positive ϵ_{Nd} values and a narrow range of zircon population are in a favour of the depleted mantle source for a considerable part of the magma. We assume that the metamorphism was caused by an intrusion of nearby 1.53-1.50 Ga AMCG Mazury complex which was also a major source of metasomatising fluids. During the subsequent cooling, rocks have been exposed to hydrothermal alteration, causing a nucleation of Fe-Cu sulfides. The available data suggests that some small isolated back-arc basins might have existed in southern Lithuania likely contemporaneous with the Oskarshamn-Jönköping belt and Vetlanda supergroup in south-central Sweden (Mansfeld et al., 2005 etc).

References:

Lindsley, D.H., Spencer, K.J., 1982. Fe-Ti oxide geothermometry: Reducing analyses of coexisting Ti-magnetite (Mt) and ilmenite (Ilm). *Eos Transactions. American Geophysical Union* 63, 471.

Mansfeld J., Beunk F. F., Barling J., 2005. 1.83 – 1.82 Ga formation of a juvenile volcanic arc – implications from U-Pb and Sm-Nd analyses of the Oskarshamn – Jönköping Belt, Southeastern Sweden. *GFF* 127, 149 – 157.