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Geotectonic setting of the Suwałki Anorthosite Massif (NE-Poland) - constraints for 3D geological modelling

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Suwałki Anorthosite Massif (SAM) is located within 200 km long Mesoproterozoic magmatic terrane called Mazury Complex (NE Poland) (Wiszniewska et al. 2002). This is a belt of granitoids and associated mafic and intermediate igneous rocks followed an E-W trending lineament extending from the Baltic Sea through northern Poland and southern Lithuania to western Belarus. Crystalline basement of the Suwałki region is covered by a thick pile (550-1300m) of Phanerozoic sedimentary rocks, which are dipping towards the SW East European Craton's border. SAM is a complex structure composed primarily of magmatic massif type anorthosites, surrounded by a rim of norite-gabbronorite and diorite rocks.

SAM is characterized by magnetic and gravimetric negative anomalies. The gravimetric one is related to anorthosite massif. It is surrounded by a few positive anomalies, which reflect occurrences of denser rocks such as granite, monzodiorite and granodiorite. The large magnetic anomaly is supposed to reflect an effect of an negative inclination of remanent magnetization of anorthosite rocks. This hypothesis was confirmed by magnetic modelling along DSS POLONAISE'97 profile P4 (Petecki, 2006). Existing measurements however do not show prevailing negative inclinations, even though they prove very high remanent magnetization of anorthosites. A pronounced residual magnetic anomalies of Udryń and Krzemianka are related to Fe–Ti–(V) ore deposits recognized by deep boreholes. Based on potential field data it was suggested that anorthosite bottom reaches 2,5-4,5 km depth. Thus it is evident that the geological architecture of SAM and its surrounding area is not fully recognized. The problem is supposed to be resolved using modern methods of geophysical transformations and 3D modelling using GeoModeller software. The final result of the research will be to recognize spatial structure of the SAM and its surrounding.

Petrological, mineralogical, geochronological (U-Pb SHRIMP method on zircons and titanite) and tectonic testing from SAM were carried out. Structural analysis were also performed on a basis of the identified tectonic structures on selected cores. Recognition of possible connections of tectonic structures with magmatic processes and pegmatite, aplite, quartz veins including their mineral composition have been checked. For pegmatite, aplite, hydrothermal and quartz veins age determinations, U-Pb SHRIMP IIe method on zircon, monazite and titanite have been done. The primary age measurements of zircons from microgranite veins within anorthosite have shown consistent Paleoproterozoic ages of protolith ($\sim$1844$\pm$11 Ma for Krzemianka 73) with Mezoproterozoic ages ($\sim$1.5 Ga) of metamorphic rims, similar to monazite ages ($\sim$1469$\pm$16 Ma). The microgranite veins are probably derived from the older Paleoproterozoic crust, carrying a relic zircons of $\sim$1.84 Ga ages but also some inherited older ages as $\sim$2.0 to 2.3 Ga. The future planned works will concern the genesis and evolution of igneous AMCG rocks suite and related ore mineralization of the SAM.

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