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A tentative model for the origin of anorthosite-gabbronorite Sejny Massif, NE Poland – Geochemistry, U–Pb ages, Sr–Nd and Hf–O isotopic composition

ANNA GRABARCZYK-GURBA[1], EWA KRZEMIŃSKA[2], LEONID SHUMLYANSKYY[3] AND DOMINIK GURBA[2]

[1]University of Warsaw
[2]Polish Geological Institute – National Research Institute
[3]Curtin University

Presenting Author: anna.grabarczyk@uw.edu.pl

The Mazury anorthosite–monzonite–charnockite–granite (AMCG) complex in northeasternmost Poland is a manifestation of Mesoproterozoic magmatism within the Fennoscandian block. The Mazury AMCG suite was emplaced into a stable continental crust, c. 300 M.y. after the last orogenic event, and comprises several rapakivi-type granite batholiths closely associated with three anorthosite-gabbronorite massifs (Suwałki, Sejny and Kętrzyn). This study concerns the Sejny massif (SM) hidden under 600 m of Phanerozoic sedimentary strata and drilled by the Sejny IG1 and IG2 boreholes.

The zircon U–Pb (SHRIMP) geochronology reveals that the anorthosites (1505 ± 6 Ma), gabbros (1503 ± 5 Ma, 1513 ± 4 Ma) and jotunites (1504 ± 7 Ma, 1514 ± 5 Ma) of the SM intruded the Paleoproterozoic (~1.83 Ga) country rocks in several magmatic pulses at c. 1514 Ma and 1504 Ma. These ages closely match those obtained for the nearby Suwałki anorthosite massif and rapakivi granitoids [1]. Antiperthite megacryst with K-feldspar lamellae are common and together with rare and slightly older entrained zircon antecrysts (1527 ± 11 Ma), indicate a polybaric crystallization and differentiation [2].

The slightly subchondritic initial Nd (ε_{Nd} from −1.3 to −2.8) and Sr isotope composition ($(^{87}Sr/^{86}Sr)_i$ = 0.7041−0.7059) of the Sejny mafic rocks differ from that of the depleted mantle and support the conclusion of melting of the lower crust with some input of juvenile mantle-derived material. The high Sr/Y (22−161) ratios of magmatic rocks reflect the crustal thickening due to former acreation and collision during the Svecofenian orogeny.

The Hf (zircon, LA-ICP-MS; ε_{Hf} from −2.3 to −7.4) and O (zircon, SHRIMP; $\delta^{18}O$ = 7.9−9.5‰) isotopic composition results from magma differentiation and/or progressive crustal contamination. The presence of zircon xenocrysts (1830 Ma) in the gabbro sample (ε_{Hf} of −7.4) emphasizes the importance of crustal assimilation during magma ascent.

[1] Wiszniewska & Krzemińska (2021), *Precambrian Research* 361, 106265.

[2] Teng & Santosh (2015), *Precambrian Research* 256, 79-101.