



Early Archaean rocks of Sarmatia

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Sarmatia, one of the three main crustal segments of the Precambrian East-European platform, comprises the Ukrainian shield and the Voronezh crystalline massif which are separated by the Late Palaeozoic Dnieper-Donets Depression. It is composed of a collage of terrains that were formed during over 2 billion years, from c. 3.8 to c. 1.7 Ga; some of these terrains can be traced across the Dnieper-Donets Depression. Geochronological and isotope-geochemical investigations have shown that significant portions of Sarmatia were formed already in the Early Archaean. In the Ukrainian shield Early Archaean rocks are known from the Dniester-Bug and Azov domains. Enderbites of the Dniester-Bug Series, which occur intercalated with mafic and ultramafic rocks, contain zircons as old as 3.75-3.78 Ga (Claesson et al., 2006; 2012) while initial Hf isotope ratios indicate derivation from mildly depleted sources.

In the Azov domain the oldest rocks known belong to the Novopavlivka complex, which includes orthogneisses, enderbites, migmatites and related granites with up to 1 m thick enclaves of pyroxenite and peridotite, amphibolites, and schists. Zircons separated from two pyroxenite samples have yielded ages of 3633 ± 16 and 3640 ± 11 Ma, while zircons from enderbite gave 3609 ± 5 Ma (Bibikova and Williams, 1990). Zircons extracted from metasediments of the Soroki and Fedorivka greenstone belts, Azov domain, have yielded ages up to 3785 Ma (Bibikova et al, 2010) and ϵ_{Hf} values of -1.6 to 1.8 for the oldest zircons. Finally, recent multigrain U-Pb dating of heavily deformed tonalitic gneisses of the Verkhnyotokmakska Stratum, Azov Domain, has given an age of 3560 ± 70 Ma (Scherbak et al., 2011). The oldest rocks of the Voronezh crystalline massif belong to the Oboyan Complex which is composed of mafic igneous rocks and sediments metamorphosed into amphibolites and gneisses. Most probably, this complex includes rocks of different ages and origins. Individual igneous zircons from amphibolites of the Oboyan complex have yielded an age of 3667 ± 13 Ma ($\epsilon_{\text{Hf}} = 1.2$ to 3.7) (Lokhov et al., 2009).

Nd isotope compositions of presumably metagneous rocks from the Dniester-Bug Series (Shumlyanskyy, 2012), the Oboyan Complex (Lokhov et al., 2009; Shchipansky et al., 2007), and unpublished Hf and Nd isotope data for various rocks from the Dniester-Bug and Azov domains indicate that both mafic rocks and enderbites are derived from depleted mantle sources.

Taken together, these results demonstrate an abundant presence of Early Archaean rocks in Sarmatia.