Geophysical Research Abstracts
Vol. 14, EGU2012-4483, 2012
EGU General Assembly 2012


# Early Archean crust in the Ukrainian Shield - U-Pb and Hf isotopic constraints

S. Claesson (1), E. Bibikova (2), L. Shumlyanskyy (3,1), and C.J. Hawkesworth (4)

(1) Swedish Museum of Natural History, Box 50007, SE-10405 Stockholm, Sweden (stefan.claesson@nrm.se), (2) Vernadsky Institute of Geochemistry and Analytical Chemistry, Russian Academy of Sciences, Kosygin str.19, Moscow 119991, Russia, (3) Institute of Geochemistry, Mineralogy and Ore Formation of the NAS, Palladina Ave., 34, 03680 Kiev-142, Ukraine, (4) University of St. Andrews, North Street, St. Andrews KY16 9AL, UK

The Ukrainian Shield includes early Archean components which have been strongly reworked in both Archean and Proterozoic time. In the Podolian Domain in the west, the oldest rocks occur in the Dniestr-Bug formation composed of dominating granulite facies granitoids (enderbites), mafic and supracrustal rocks. Zircon from these rocks commonly have complex internal structures, reflecting multiple episodes of growth and recrystallisation in both Archean and Paleoproterozoic time. U-Pb SIMS dating of enderbite zircon has identified a group with $^{207}Pb/^{206}Pb$ ages of c. 3.65 Ga, and also older zircon up to 3.75 Ga. Dniestr-Bug rocks interpreted as metasediments also have yielded ages up to c 3.75 Ga.

In Hf-time space, most enderbite zircon analyses form a well defined array with a slope corresponding to $^{176}Lu/^{177}Hf$ close to zero, which intersects the CHUR composition at 3.75 Ga and an assumed DM evolution curve at c. 3.9 Ga. Some analyses plot on the young side of this array. We suggest that zircon along this Hf-age array crystallized during a magmatic event at c. 3.6 Ga, or earlier, and that individual zircon crystals since then have been individual small closed Lu-Hf reservoirs. At the same time, the crystals have been open to Pb loss during the metamorphic reworking which has caused recrystallisation and alteration of primary magmatic zircon, and growth of new zircon.

The crustal provenance age of the material which was melted to produce the enderbite magma may be constrained by assumed compositions of this crustal precursor and of the mantle from which it was derived. For a mafic primary crust with $^{176}Lu/^{177}Hf$=0.022, derived from a depleted mantle source, the crustal provenance age is c. 4.2 Ga. A more differentiated primary crust, less depleted mantle source, or older age of the enderbite result in younger model ages for this primary crust.

In the Azov Domain in the east, ages for detrital zircon from the Soroki and Fedorovka greenstone belts vary from c. 3.6 to 2.6 Ga. A 3.5-3.6 Ga age group demonstrates that Paleoarchean crust was widely distributed, and zircon cores older than 3.7 Ga have been identified. Soroki greenstone belt data forms two groups in Hf-time space, with a few scattered results. The rocks in which these zircons crystallised may be derived from two batches of primary continental crust, with maximum model ages estimated to c. 4.1 Ga and 3.4 Ga respectively.