

# The Eoarchean to Mesoproterozoic history of granulites in the Dniester–Bouh Domain, Ukrainian Shield as revealed by petrochronology

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The Dniester–Bouh Domain of the Ukrainian Shield hosts a granulite-facies association of granitoids intercalated with mafic and ultramafic rocks. Zircon U–Pb geochronology indicates the rocks record three major tectono-magmatic events. The primary enderbites preserve magmatic (crystallisation) ages of  $3786 \pm 32$  Ma. The second event occurred between ca. 3000 and 2700 Ma and resulted in the formation of igneous charnockites and metasomatic rocks. It was possibly accompanied by high-grade metamorphism. The final igneous and metamorphic event, recognized in zircon and monazite dates, took place in response to granulite facies metamorphism at ca. 2000 Ma.

A detailed petrochronological study permits a more refined understanding of the history of the rocks. Garnet in the studied rocks yields preliminary Lu–Hf ages between ca. 2000 and 1800 Ma, with apatite Sm–Nd ages falling in the same range. Amphiboles from two samples yield consistent  $^{40}\text{Ar}/^{39}\text{Ar}$  ages of ca. 1682 and 1670 Ma. U–Pb ages for rutile range from ca. 1495 to 1475 Ma, with apatite U–Pb ages at around 1400 Ma (Fig. 1).

The temperatures and pressures of granulite facies metamorphism at ca. 2000 Ma are estimated at 825–720 °C and 7.5–6.2 kb. Our data indicate that at ca. 1800 Ma the temperature had declined to ~650 °C, then to ~530 °C at 1680 Ma, and finally to 450–400 °C at ca. 1500–1400 Ma. Hence, assuming an average geothermal gradient of 30 °C/km, the whole area experienced slow exhumation from ca. 25 km to ca. 10 km over 500–600 Myr, corresponding to a cooling rate of around 1 °C/Myr.

The reason for such slow exhumation remains unclear. According to recent continental reconstructions, the Dniester–Bouh Domain of the Ukrainian Shield was probably attached to West Africa and located in the internal part of the Nuna supercontinent. No tectono-magmatic events that might cause slow exhumation of the lower crust are currently known from this area in the Paleo- to Mesoproterozoic.

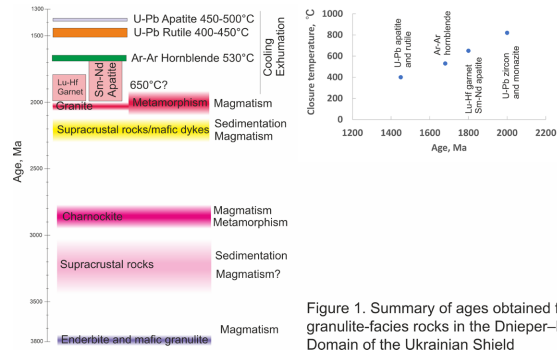


Figure 1. Summary of ages obtained for granulite-facies rocks in the Dnieper–Bouh Domain of the Ukrainian Shield