The age of cratonic roots: Archean dunites vs. Proterozoic harzburgites in the central Siberian craton

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Olivine-rich dunites (coarse and megacrystalline, ol>1 cm) and low-op (11–21%) harzburgites from the Udachnaya kimberlite are equilibrated at 783–1154°C and 3.9–6.5 GPa. They have similar WR ranges of Ca, Al, Fe, Cr and Mg# (0.917–0.934), but the dunites may have higher MgO, NiO and Mg/Si_{mol}. Modal abundances, Ca and Al are not related to $Mg\#_{WR}$, and may not result from distinct melting degrees. Robust T_{RD} ages for low-opx harzburgites (1.9–2.1 Ga; aver. 2.0±0.1 Ga) are manifestly lower than for dunites (2.4–3.1 Ga). The dunites define two subsets with av. T_{RD} of 2.6±0.1 Ga and 3.0±0.1 Ga, and T_{MA} of 3.0 ± 0.2 Ga and 3.3 ± 0.1 Ga. Dunite grain size (coarse vs. megacrystalline) is not related to age. The dunites could not be formed by re-melting of harzburgites, e.g. in arc settings, but are relics of Archean lithospheric mantle incorporated during the final assembly of the Siberian craton in the Paleoproterozoic, in line with zircon U-Pb crustal formation ages. The formation of cratonic lithosphere did not stop at the AR-PR boundary, but continued in the Paleoproterozoic, likely as well as the transition from the 'Archean' to modern tectonic regimes.

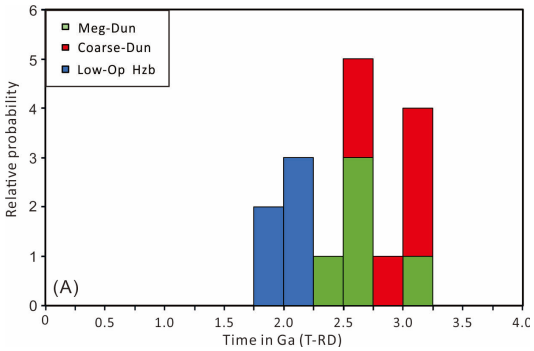

Figure 1: Re-Os T_{RD} ages of xenoliths.