Preservation of Archaean cratonic mantle below Grib kimberlite (NW Russia) through Proterozoic rifting and collision

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Hadaean to Paleoarchaean continental crust is stabilised by the presence of thick buoyant lithospheric mantle 'keels'. However, these cratonic 'keels' can be destroyed leading to low preservation potential of old crust and limiting our ability to study magmatic and tectonic processes on the early Earth. For example, destruction of the cratonic keel below the eastern block of the North China cratonic keel occurred during Phanerozoic collisonal processes, although minor Archean depleted mantle domains were still preserved [1].

Due to this stabilising influence of old cratonic mantle on the preservation of the Earth's oldest crust, we need to understand how these 'keels' are affected by rifting and other tectonic processes. Here we analysed mantle peridotite from the Grib kimberlite in NW Russia to evaluate how the mantle lithosphere was affected by Neoproterozoic rifting (2.5 – 2.0 Ga) and Lapland-Kola orogenic processes during the Mesoproterozoic (1.9 – 1.8 Ga). Samples can be split into two groups: 1) Unradiogenic $^{187}Os/^{188}Os$ with T_{RD} ages of 3.3, 2.4 and 1.2 Ga. These samples all have P-PGE depleted chondrite-normalised PGE patterns (PGE_N) that are characteristic of depleted cratonic peridotities [2]; and 2) Radiogenic $^{187}Os/^{188}Os$ for which no T_{RD} ages could be calculated.

Together these results document multiple depletion events in the cratonic mantle lithosphere, from the Mesoarchaean to the Neoproterozoic. Even though Lapland-Kola orogenic activity overprinted the lithosphere, depleted lithosphere domains are still prevalent. Importantly, the persistence of depleted Mesoarchean peridotite shows that Proterozoic rifting and collision did not completely destroy the Archaean mantle lithosphere in this area, as also observed along the margin of the Karelian craton in the Baltic shield [3].

[1] Liu et al. (2014) *Tectonophysics*, 650, 104-112
[2] Pearson et al. (2004) *Chemical Geology*, 208, 29-59
[3] Peltonen and Brugmann (2006) *Lithos*, 89, 405-423