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Ultra-refractory peridotite xenoliths: what's their story?

Nina S.C. Simon
University of Oslo, Physics of Geological Processes, Oslo, Norway (nina.simon@geo.uio.no)

Ultra-refractory harzburgitic mantle is abundantly sampled as xenoliths in ocean island magmas and along magmatic arcs. These xenoliths are characterized by the absence of primary clinopyroxene, low whole rock aluminum, calcium and HREE concentrations, low aluminum oxide in orthopyroxene (<3 wt%), high Cr-number in spinel (0.3-0.8) and high forsterite contents in olivine (>91.5). Due to their whole rock composition, ultra-refractory harzburgites have low densities and very high viscosities relative to "normal", more fertile asthenospheric material. Thus, they might be preserved as fragments in the convecting mantle over long periods of time and tend to accumulate at the top of the convecting mantle. There, they may accrete to younger oceanic plate and may be sampled and carried to the surface by ocean island volcanism.
If we accept that ultra-refractory peridotites are abundant in the oceanic and continental lithosphere and in the convecting mantle (as seems to be supported by geochemical and geophysical observations) the question arises as to how these peridotites actually form and how they influence mantle geochemistry and dynamics. The formation of ultra-refractory harzburgitic residues requires melting beyond the stability of clinopyroxene. In conventional decompression melting models, such high degrees of partial melting require high potential mantle temperatures and large decompression to shallow levels - conditions which are rarely met in the modern Earth. We may consider several hypotheses for the formation of ultra-refractory mantle: 1) It formed in the Archaean by partial melting in a hotter Earth, implying that all ultra-refractory peridotites are ancient. 2) It formed during catastrophic melting events caused by slab avalanches and mantle overturn, possibly related to episodic major crust forming events. 3) Melt- or fluid-rock interactions produce refractory compositions without the need for excessively high temperatures. 4) An additional heat source exists in the mantle, for example viscous dissipation of heat during convective flow.
I will discuss these hypotheses in the framework of existing data, and elaborate on some of the implications for geodynamics and the interpretation of geophysical measurements.