Abstract

The past decade has provided widespread evidence for isotopic disequilibrium between exhumed abyssal peridotites and associated gabbroic and basaltic bodies, calling into question the commonly held assumption of a direct genetic relationship between mantle rocks and spatially related melts. Alpine-Apennine ophiolites, dismembered remnants of the Jurassic Ligurian Tethys, are similar to present-day (ultra)slow spreading environments and ocean-continent transition zones, and offer unique opportunities to study mantle processes. We present new results from a refractory peridotite within the Civrari Ophiolite (northern Italian Alps) containing clinopyroxene showing strongly radiogenic $^{143}Nd/^{144}Nd$ (0.5145–0.5147) and highly depleted $^{147}Sm/^{144}Nd$ (1.1–1.2) resulting from ~13%–15% near-fractional melting. The isotopic compositions of Alpine-Apennine spinel peridotites that did not undergo Jurassic refertilization and impregnation show a pseudo-isochron age of 273 ± 24 Ma, which overlaps widespread Permian magmatic activity in Western Europe during post-Variscan extension. We propose that extremely refractory peridotites within ocean-continent transition zones offer compelling evidence that mantle isotopic heterogeneity in (ultra)slow spreading environments is related to the exhumation of older and variably depleted rafts of subcontinental lithospheric mantle during continental breakup and rifting. We suggest that these residual peridotites offer snapshots of older partial melting events related to ancient crust-forming processes prior to their subsequent exhumation at the ocean floor.