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Lithospheric mantle beneath the N part of Vogelsberg (Germany)

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The Miocene (18-13 Ma) Vogelsberg Volcanic Field in central part of Germany (Bogaard & Wörner 2003) is one of the largest ones in the Central European Volcanic Province. The alkaline basaltic lavas of the youngest (16.6-14.7 Ma) volcanic cycle locally contain numerous mantle-derived peridotite xenoliths. We studied the xenolith suite (13 samples) from Dreihausen quarry in northern Vogelsberg. The xenoliths are rounded, typically 8-12 cm in diameter. They have the composition of harzburgite to clinopyroxene-poor lherzolite. Scarce clinopyroxenites and glimmerites occur as well.

The most depleted rock in the studied suite is a protogranular harzburgite (sample 3816) consisting of olivine (Fo 91.3, NiO 0.40 wt. %, Ca 750 ppm), Al poor orthopyroxene (Mg# 0.92, 0.10 atoms of Al pfu) and chromian spinel (Cr# 0.57). Sinusoidal REE pattern of orthopyroxene shows HREE depletion and LREE enrichment relative to orthopyroxenes from other samples of the suite. Other peridotites contain olivine (Fo 91.0 to 89.5), relatively aluminous orthopyroxene (0.15 – 0.25 atoms of Al pfu) and clinopyroxene (0.20 – 0.33 atoms of Al pfu), and aluminous spinel (Cr# 0.10-0.25). The orthopyroxene REE patterns exhibit gradual depletion from HREE to LREE. Those of clinopyroxene show commonly LREE enrichment relative to HREE, or, seldom, have flat, slightly LREE depleted patterns identical to those of DMM clinopyroxene (Workman & Hart 2005).

The harzburgite 3816 is strongly melt-depleted with very slight metasomatic changes. The rest of the peridotitic suite was affected to a different degree by cryptic metasomatism. It is striking that all the metasomatic effects are typical of reactive silicate melt percolation and no evidence of carbonatitic metasomatism does occur in the studied suite. Vogelsberg is located in the southern part of Rheno-Hercynian zone of the European Variscan orogen, at the northern tip of the Upper Rhine Graben. The non-metasomatised xenolith could represent the Rheno-Hercynian lithospheric mantle assembled in Variscan times. The metasomatism possibly is related to the rifting associated to the opening of the Upper Rhine Graben.

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