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Re-fertilisation of the lithosphere beneath Eastern Transylvanian Basin

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Mantle xenoliths from Mts. Perşani area (Eastern Transylvanian Basin) are amph-bearing and anhydrous lherzolites and ol-websterites. Most samples are coarse-grained and have protogranular/porphyroclastic textures. Amphibole is found as disseminated crystals around spinel, associated with opx and cpx, and/or as discontinuous veinlets within the matrix in textural equilibrium with the peridotite minerals. A few samples show glassy patches and veinlets with secondary ol, cpx and sp (not related to host basalt infiltration) occur. Modal percentage referring to samples devoid of glassy patches and pyrometamorphic textures reveal relative proportions difficult to account for a simple residual trend. At comparable mg# [MgO/(MgO+FeO) wt% = 88.3-89.0], opx/cpx modal ratio in lherzolites vary from 0.68 to 2.16 and spinel from 1 to 3%. Primary ol have mg# varying from 89.0 to 91.8 whereas secondary idiomorphic crystals reach higher values, up to 94.1. Opx mg# and Al2O3 vary from 89.14 to 91.12and from 2.84 to 5.90 wt%, respectively. Primary cpx (cpx1) have mg# varying from 89.01 to 92.99 together with high Al2O3 (3.45-8.16 wt%) contents and TiO2 varying from 0.11 to 0.71 wt%. Primary sp are alumina-rich, with cr# varying between 6.64 and 34.60 whereas. Amphiboles have high mg# (86.55-89.50 wt%), Na2O (2.91-3.81 wt%) and Cr2O3 (0.73-1.57 wt%). Whole rock and phase major element compositions (cpx and sp) do not follow the expected “normal” depletion trend, in particular for their high Al2O3 content. Based on trace element contents three different groups of cpx1 can be recognized. The first group is characterized by slight depletion in LREE [(La/Yb)N, 0.42-1.03] with HREE at 6-9 x Ch, negative Zr-Hf anomaly, Sr positive anomaly (Sr/Sr*, 0.91-2.00) and highly variable Th and U contents. The second group is equally depleted in LREE [(La/Yb)N, 0.34-1.37] but at higher HREE content (11-13 xCh). It has negative to positive Hf and Sr anomalies, and less variable Th and U contents. The third group is LREE enriched [(La/Yb)N, 1.36-5.45] with HREE at 9-11 xCh and Sr negative anomaly (Sr/Sr*, 0.65-0.96). All cpx1 share a slight but peculiar Eu positive anomaly. Amphiboles have patterns identical to associated cpx except for those elements which are better partitioned into amphibole, such as Nb, Ta, Sr and Ti. Opx have fractionated HREE (Dy, 0.27-0.7 x Chondrite; Yb, 0.72-1.76 x Chondrite) and show a gradual increase in LREE and Sr, with (La/Yb)N varying from 0.03 to 0.2 and Sr/Sr* from 0.17 to 0.98. They are similar to opx in slab-melt contaminated mantle xenoliths from Kapfenstein. Accurate measurements of Ca contents in olivine allowed application of the Ca-exchange barometer coupled with the two-pyroxene thermometer (temp, 920-1010°C; pressure 13.0-17.7 Kbar). The high modal percentage of opx, cpx and spinel, coupled with their high Al2O3 content, the high REE and the positive anomalies in Sr and Eu in cpx seem to rule out that we are simply facing a very fertile mantle portion, pointing toward a re-fertilisation process involving an hydrate REE-rich, silica-saturated melt with high Sr contents. Cpx and spinel (and amphibole) are more probably the result of a re-fertilisation process of variably fertile mantle by a melt originally high in Al and Sr.