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Early Paleognene alkaline magmatism in western Romania (Poiana Rusca) – Evidence for two different sources?

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Small volume alkaline basalts from Poiana Rusca (Romania) were studied in order to get new insights into petrogenesis and tectonic environment of early stage alkaline volcanism in the south Carpathian-Pannonian region. The occurrence of the sampled outcrops is limited to the southern Apuseni mountains (Inner Carpathian mountain belt) representing the oldest alkaline volcanism in the south-eastern Carpathian region. Peridotite-bearing basanites (SiO_2, MgO, CaO and Na_2O range between 42.9-45.4, 9.8-13.1, 10.3-11.4 and 3.6-5 wt. %) indicate according to their trace element chemistry a deep magmatic source. Primitive Mantle (PM) normalized trace elements have similar to OIB patterns with high incompatible element abundances and a negative K anomaly. Thorium shows a slight negative anomaly relative to Ba and Nb. Shifted but parallel patterns of PM normalized REE [(La/Yb)N: 18-23] suggest minor en-route Ol fractionation. The absence of negative Nb and Ta anomalies excludes any influence from subduction related processes. Their high (La/Yb)N ratios indicate partial melting in the garnet peridotite field with garnet in the residue.
Slightly higher evolved trachybasalts have a very homogeneous bulk major and trace element chemistry (SiO_2, MgO, CaO and Na_2O: 49.1-49.6, 7.9-8.6, 8.6-9.1 and 3.6-4.1 wt. %). In contrast to the basanites, the trachybasalts in the PM-normalized trace elements diagram show significantly lower incompatible element abundances without any K anomaly. Besides this, the trachybasalts, compared to the basanites, have considerably lower Ba/La ratios (basanites 18-33; trachybasalts 12-20) suggesting different sources and apparently different degrees of partial melting at different depths.
Older data from the area show similar trace element patterns for these early Paleogene rocks; however, the petrogenesis of the youngest (Pliocene/Pleistocene) alkaline volcanism at least in Romania indicates subduction-enriched lithosphere interaction.

Small basanite included spinel-bearing mantle-xenoliths in general suppose a fertile mantle source with only few evidences for metasomatic processes. EPMA olivine analyses indicate Mg# in a range of 89.3 to 91 except one sample that shows host-melt affected more fayalitic composition at the rim (Mg#: 83.6-87). Clinopyroxenes reveal diopside composition with MgO, Al_2O_3, CaO and FeO ranging between 15.5-16.2, 5.9-6.8, 18.8-21.2 and 2.4-3.3 wt. % respectively. LA-ICP-MS analyses on well equilibrated clinopyroxenes from peridotite xenoliths indicate that some of the xenoliths have experienced cryptic metasomatism. Varying Chondrite normalized REE patterns show that the unaffected cpx grains have (La/Yb)N: 1.1-1.2 and the metasomatically affected have (La/Yb)N: 14-26. Enstatite compositions are homogeneous with MgO and FeO contents of 32.3-33.5, 5.7-6.5 wt. %. Spinel analyses vary from 49.5-58.9 wt. % in Al_2O_3 and 8.9-17.4 wt. % in Cr_2O_3.