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Pyroxenites of Kukesi Massif, Mirdita Ophiolite – geological record for magmatic system in SSZ environment – preliminary results

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Kukesi massif is located in the eastern part of the Mirdita Ophiolite (northern Albania), which marks suture after Neo-Thetyan ocean closure. It is formed of well-preserved mantle and crustal sections which exhibit Supra-Subduction Zone affinity (e.g. Dilek and Furnes 2009, Lithos). Lower part of the mantle section of the Kukesi massif consist mainly of harzburgites, whereas dunites are located close to Moho. Crustal section records transition from lower part formed by peridotites and pyroxenites (so called intermediate zone after Hoxha and Boullier 1995, Tectonophysics) to gabbros. In this study we focus on composition and origin of pyroxenites occurring in the mantle and lower crustal parts of the Kukesi massif.

In this study we studied 9 samples. They have composition of olivine websterite, clinopyroxenite, orthopyroxenite, hornblende-clinopyroxenite and websterite. Five of the analyzed samples have mantle origin (M): we studied (M)-olivine websterites and (M)-clinopyroxenite from harzburgitic part, as well as two (M)-orthopyroxenitic veins (one with clinopyroxenitic central part - composite vein) with minor amphibole cross-cutting dunites from one locality. From intermediate zone in crustal (C) part we collected (C)-hornblende-clinopyroxenites and (C)-websterite.

Clinopyroxene composition is homogeneous in (M)-olivine-websterites (Mg#=84.5-87 and 88.8-90.5; Al=0.07-0.1 and 0.05-0.07, respectively), (M)-clinopyroxenite (Mg#=84-86, Al=0.04-0.08), (C)-hornblende-clinopyroxenites (Mg#=88.5-91, Al=0.08-0.12a.p.f.u.) and (C)-websterite (Mg#=87-88; Al=0.13-0.16a.p.f.u.). It differs widely between (M)-orthopyroxenitic veins: from Mg#=85-94 and Al=0.02-0.08 a.p.f.u in clinopyroxenitic part of composite vein to Mg#=93.6-95 and Al=0.01-0.03 in the purely orthopyroxenitic one. Orthopyroxene from two samples of (M)-olivine websterites have either Mg#=83 and Al~0.07 a.p.f.u ($Fo^{olivine}$=81.5) or Mg#=87 and Al~0.04 a.p.f.u ($Fo^{olivine}$=86). Orthopyroxene composition in composite(M)-vein varies in wide ranges (Mg#=83-89; Al=0.04-0.08 a.p.f.u.); the other vein is homogeneous (Mg#=90-91, Al=0.02-0.03 a.p.f.u, $Fo^{olivine}$=86.8-90); in (C)-websterite orthopyroxene has Mg#=82.4-84 and Al=0.12-0.14 a.p.f.u. Amphibole has composition of tremolite-actinolite. Spinel, where present, is highly chromian (Cr#=0.59-0.80).

Clinopyroxene is LREE-depleted in most of the samples, the $(La/Lu)_N$=0.03-0.08. It is also LREE-depleted in (M)-clinopyroxenite ($(La/Lu)_N$=0.05-0.23), but the contents of trace elements are higher than in other samples (eg. Lu_N=0.79-2.75 vs. 0.40-0.85). In (M)-veins the LREE contents are approximately at primitive mantle level ($(La/Lu)_N$=0.28-1.66). Clinopyroxene in all samples has positive Th-U, Pb and Sr anomalies and negative Ta and Zr anomalies, but concentrations of trace elements is significantly higher in (M) clinopyroxenite and veins.

The presence of tremolite and actinolite points to a retrogressive metamorphism which affected the rocks. The LREE-depleted nature of clinopyroxene forming all the pyroxenites and presence of orthopyroxene point to crystallization of the rocks from tholeiitic melt, but variations in Mg# and REE content in clinopyroxene may reflect formation either from different generations of melts or from melts fractionated due to reactive percolation. Variations in composition of the parental melts is visible even in a scale of one outcrop, which is demonstrated by (M)-orthopyroxenite veins with various modal composition and mineral major and trace elements compositions.

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