New petrographic and geochemical data on the upper mantle beneath the Styrian Basin (Austria and Slovenia)

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Alkali basaltic volcanism in the Carpathian-Pannonian Region (CPR) occurred sporadically across eastern Austria, northern Slovenia, Hungary, western Romania and southern Slovakia during Plio-Pleistocene times (Szabó *et al.,* 2004). Lavas and their pyroclasts often contain ultramafic xenoliths, and the majority of them have been extensively studied (e.g. Szabó *et al.,* 2004 and references therein), except the Styrian Basin Volcanic Field (SBVF, Eastern Austria). Geochemical and isotopic studies on the ultramafic xenoliths from the SB published are mostly focused on a few well-known volcanic centers (e.g., Kapfenstein & Tobaj) (e.g. Kurat *et al.,* 1980; Vaselli *et al*., 1996; Falus *et al.,* 2000, Coltorti *et al*., 2007, Dobosi *et al*., 2010).

In this study new petrographic, textural and mineral chemistry data are presented on selected ultramafic xenoliths from three localities of the SBVF (Neuhaus, Güssing and Grad), which were not studied previously in details. The goals of this study are: i) to characterize the lithospheric mantle composition beneath the SBVF to a greater extent than in previous studies; ii) to assess whether SBVF lithospheric mantle was affected by geochemical processes similar to those observed in other ultramafic xenolith suites from the CPR.

Xenoliths have variable size, from 2-3 cm at Grad up to 5-8 cm at Güssing and Neuhaus. Spinel lherzolites, harzburgites are all present and there is a peculiar abundance of olivine-websterites. The orthopyroxene/clinopyroxene ratio in the suite shows a great variability (between 0.5 and 10) compared to the Phanerozoic subcontinental lithospheric mantle peridotites, which show values around 2 (Downes, 1997). In the xenoliths olivine is typically kink-banded, which is a sign of slight mantle deformation and ortho- and clinopyroxenes frequently show exsolution lamellae. Some of the samples contain minor interstitial amphibole.

The SBVF peridotite xenoliths have mostly protogranular, protogranular to porphyroclastic and porphyroclastic textures (Fig. 1). Pyroxenites, however, generally show a coarse-grained igneous texture. The textural distribution of the studied peridotite xenoliths is more variable compared to previously reported suites from the SBVF, originated basically from Kapfenstein.

The mg# number of the analysed olivines are ranging between 0.87 and 0.91, their NiO content varies between 0.18-0.37 wt. %. The CaO concentrations are between 0.02 and 0.10 wt. %.

The orthopyroxenes mg# numbers are varying between 0.89 and 0.92. Their Al_2O_3 content is between 1.80 and 5.72 wt. %. The mg# number of clinopyroxenes are varying between 0.84 and 0.94. The cr# (0.10-0.37) and mg# (0.63-0.81) number of the spinels are showing great variability. All of the samples, except one sample from Güssing, are within the olivine-spinel mantle array (OSMA, Arai, 1987), which suggest only little mantle metasomatism, based on major element geochemistry. Based on their clinopyroxene and spinel major element geochemistry, two xenoliths from Neuhaus are the most depleted ones, with low Al_2O_3, Na_2O and high Cr_2O_3 content.

The analysed amphiboles have 0.7-0.89 mg# number, and are pargasite and hastingsites. Their Na_2O and TiO_2 contents are varied, the Grad xenoliths are more depleted in Na_2O, and richer in TiO_2, compared to the Güssing samples.

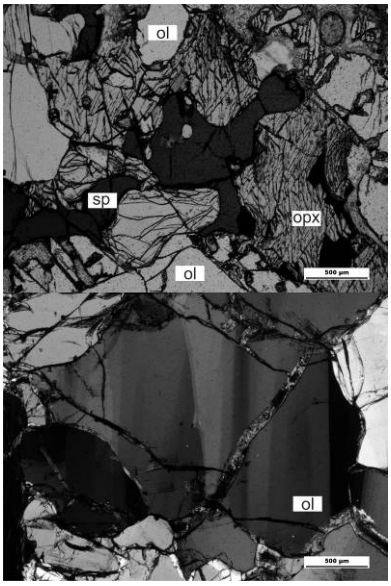

Fig. 1.: Upper: Protogranular texture, with a typical spinel-orthopyroxene cluster(Güssing 2 xenolith, 1N); Lower: Porphyroclastic texture, with kink bands in an olivine porphyroclast (Neuhaus 1 xenolith, +N).

Preliminary results show that the lithospheric mantle beneath the SBVF can be considered to be more deformed that previously thought (e.g. Dobosi et al., 2010). Although the SBVF was thought to be dominated by depleted and underformed peridotites based on the previous studies (e.g. Kurat et al., 1980) focusing mostly on Kapfenstein locality, the enrichment by metasomatic agents have been proved by the presence of ortho- and clinopyroxene rich rocks, as well as the appearance of amphiboles. On a regional scale, the SBVF lithospheric mantle can be compared to the other volcanic fields in the CPR (Szabó et al., 2004) that went through extensive mantle metasomatism.

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