Geophysical Research Abstracts,
Vol. 10, EGU2008-A-11261, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-11261
EGU General Assembly 2008

Petrogenesis of the Late Miocene-Pliocene alkali mafic rocks of the Pannonian Basin - inferences from the olivine compositions

T. Sági (1), S. Harangi (1) and T. Ntaflos (2)

(1) Department of Petrology and Geochemistry, Eötvös University, Budapest, H-1117 Pázmány Péter sétány 1/C, Hungary (e-mail: cseregle@gmail.com) (2) Department of Lithospheric Sciences, University of Vienna, Vienna, Austria

The origin of the Neogene-Quaternary alkaline mafic magmas of Europe is still a subject of debate, despite the vast amount of new data published in recent decades. The end-members of the tectonic models are: (1) magma generation is related to localised mantle plumes; (2) magma generation is due to plate tectonic processes, mostly related to Alpine convergence. The Carpathian-Pannonian Region (CPR), situated in eastern-central Europe, has a unique setting among the European alkaline mafic volcanic fields. The CPR is underlain by a high seismic velocity body in the mantle transitional zone, thus, a hot mantle plume or a plume finger cannot easily arise from the relatively 'cold' base of the upper mantle. Several characteristic features of the mantle plumes are also missing in this region. However, to test the possible existence of a hot narrow mantle plume beneath this region, we attempt to estimate the mantle potential temperature based on the composition of the olivine phenocrysts. We selected those occurrences, where the olivines contained also spinel inclusions and thus, they are candidate of liquidus phases. The samples come from different volcanic fields of the Western Pannonian Basin (Uzsa, Ság, Pauliberg and Steinberg-Feldbach). In addition, they cover a relatively large time span from 11 Ma (Pauliberg), through 5,5 Ma (Ság, Uzsa) to about 3 Ma (Feldbach). Each basalts have relatively high mg-number (0.65-0.68) implying only minor olivine fractionation. Trace element modelling suggests that the parental magmas could have been formed in the garnet-peridotite stability field, in the asthenosphere by various degree of partial melting. The most primitive olivines

have a Fo content ranging from 0.82 to 0.87 mol%. The most magnesian olivine phenocrysts (Fo=0.85-0.87 mol%) are found in the Pauliberg and Ság basalts. During the magma evolution, the CaO and MnO content increase in the olivines with decreasing Fo content. The Fe values shows a positive correlation with the Mn. However, each volcano has a distinct slope in the Fe vs. Mn diagram. This can be explained by crystallization under different redox conditions. The composition of the spinel inclusions in the olivines show a relatively large range with a cr-number ranging from 0.36 to 0.65. The highest cr-number was found in the Pauliberg and Ság basalts, those which have the most magnesian olivines. This might indicate that these basaltic melts could have derived from the most refractory mantle sources. The olivine-liquid equilibria are particularly useful to estimate the mantle potential temperature. For this, various calibrations can be found in the literature. In this study, we used the Putirka (2005, Gˆ3, 6/5) scheme for the T estimation. We got potential temperature values ranging from 1250oC to 1400oC. The highest temperature values were obtained for the oldest basalts (Pauliberg), whereas the others are around 1300oC. This is consistent with the petrogenetic models of the alkali basalt from the Pannonian Basin invoking no hot mantle plume.