Geophysical Research Abstracts, Vol. 8, 10212, 2006
SRef-ID: 1607-7962/gra/EGU06-A-10212
© European Geosciences Union 2006

Lithosphere penetrating structural elements determine the composition of magmas within the Central European Volcanic Province (CEVP)

M. Abratis (1), L. Viereck-Götte (1), R. Hentschel (1,2), D. Munsel (1), V. Cajz 3) and J. Ulrych (3)

(1) Institut für Geowissenschaften, Friedrich-Schiller-Universität, Burgweg 11, D-07749 Jena, Germany, (2) Institut für Mineralogie, TU Freiberg, Brennhausgasse 14, D-09599 Freiberg, Germany, (3) Institute of Geology, Academy of Sciences CR, Rozvojova 135, 16502 Praha 6, Czech Republic. (michael.abratis@uni-jena.de)

We studied a section of the roughly E-W trending chain of Cenozoic volcanic fields in Central Europe that extends from western Germany to Lower Silesia. The section comprises the volcanic fields of the Rhön, the Heldburg Dike Swarm, Upper Franconia, and the Vogtland in SW Saxony and NW Bohemia. While in the Rhön alkali basalts dominate over tholeiites and minor basanites, the magmas in the Heldburg Dike Swarm are mainly basanites dominating over alkali basalts and minor nephelinites. While in Upper Franconia basanites and nephelinites occur in even amounts and melilite-bearing nephelinites being rare, nephelinites (often melilite-bearing) dominate over basanites and melilitites within the Cheb basin and its northern extension, the Vogtland.

The data indicate that the magmas which were erupted tend to be the more silica undersaturated the closer they are generated to the recent zone of earthquake swarms along the Mariánské Lázně (Marienbad) fault zone crossing the Eger (Ohře) Rift in NW Bohemia. This complements the data by Ulrych et al. [1] which signify the same for the mafic rocks within the Eger (Ohře) Rift approaching the zone of recent earthquake swarms from the east, while no variations are developed with distance to the rift structure of the Eger (Ohře) Rift.

A chemically uniform source is indicated for all rocks as they are identical with respect to their Sr- and Nd-isotope characteristics which in turn is identical to the com-

mon source component of all of the western Mid-European Neogene magma fields [2, 3]. The lateral differences in magma composition observed are thus either due to decreasing degrees of melting of the subcontinental mantle or to increasing depths of melting or to a combination of both. This implies either the lowest degrees of melting (zone of least melting energy available) or deepest depths of melt segregation along the Mariánské Lázně fault zone. The REE characteristics suggest that only the eastern more silica undersaturated magmas segregated within the garnet stability field, while the depth of last equilibration decreased towards the west. This is in agreement with (a) even lower depths of segregation in the Vogelsberg volcanic field [4], the western extension of the studied section of the CEVP, as well as (b) the lithospheric thickness increasing eastward [5].

The data suggest that the upper crustal expression of the Mariánské Lázně (Marienbad) fault zone marks a structural element traversing through the subcontinental lithospheric mantle, that may have been formed during the accretion of mid Europe to the Baltic craton during the Variscan orogeny. This compares well with identical dependencies in magma generation being developed approaching the NW-SE trending Elbe (Labe) fault zone in NE Bohemia and paralleling elements in Lower Silesia [1,6]. Thus, old fault systems paralleling the western boundary of the Baltic craton within mid Europe have a larger influence on magma generation than surficial expressions of Neogene rifts.

References:

[1] Ulrych, Pivec, Lang, Balogh & Kropáček (1999): Geolines 9: 123-129. – [2] Hoernle, Zhang & Graham (1995): Nature 374: 34-39. – [3] Wilson & Patterson (2001): GSA Spec Pap 352: 37-58. – [4] Bogaard & Wörner (2003): J Petrol 44: 569-602. – [5] Babuska & Plomerova (2001): Tectonophys 332: 185-199. – [6] Anna Ladenberger, pers. comm. 2005