Cenozoic intraplate volcanism in Central Europe determined by LAB topography

MICHAEL ABRATIS AND LOTHAR VIERECK-GOETTE

Institute of Geosciences, Friedrich-Schiller-Universitaet Jena, Germany

Several intraplate volcanic fields between the Eifel (Germany) and Silesia (Poland) form the northern E – W oriented zone of the Central European Cenozoic Igneous Province (CECIP). The mafic magmas show systematic regional trends in geochemistry and mineralogy that require variations of the melting processes in the upper mantle. From the Eifel to NW Bohemia the magmas exhibit increasing Si-saturation and decreasing $(La/Yb)_N$ ratios approaching the volcanic field of the Vogelsberg from both sides. The chemical variations require (1) an increasing degree of partial melting and (2) shallower equilibration depths of melt segregation indicated by increasing melt proportions from the spinel instead of garnet lherzolite mantle. A correlation of the geochemical and mineralogical data is rather obvious with the decreasing depth of the lithosphere-asthenosphere boundary (LAB) from 100 to 60 km towards the Vogelsberg. Both characteristics can thus be explained by assuming (1) a background potential for (melilite) nephelinitic melt formation along the volcanic zone due to slight buckling of the European lithosphere induced by the alpine deformation front and (2) an overprint of increasing energy supply due to increasing amounts of lithospheric uplift and rifting (or more unlikely temperature supply) towards the Vogelsberg, which marks the crossing of the northern extension of the Rhine Graben with the E-W running buckled zone.

Within the Bohemian Massif towards Silesia the chemical variations indicate an additional overprint by lithosphere penetrating NNW-running tectonic structures paralleling the Tornquist-Teisseyre-Lineament, the Elbe zone as well as the zone of earthquake swarms crossing the Cheb Basin). Approaching these structures from both sides the necessary amount of partial mantle melting decreases as well as the volumes of erupted magma, an observation similar to oceanic fracture zones. This may be explained by the cooling effect of these tectonic elements on the melting zone at the LAB or by metasomatically induced linear lithospheric mantle heterogeneities.

From the present data we propose a genetic model where the LAB topography strongly determines the composition of the Cenozoic intraplate volcanics in Central Europe.

Sources of chemical elements in fumarols of active volcanic regions (Ebeco volcano, Paramushir Island)

N.A. ABROSIMOVA* AND S.B. BORTNIKOVA

Trofimuk Institute of Petroleum Geology and Geophysics, SB of the RAS, 3, Koptuga pr., 630090 Novosibirsk, Russia (*correspondence: geonat86@mail.ru)

Volcanic fumaroles are important objects for study gas transport of chemical elements. We can directly observe chemical elements transported in gas phase in depositions of fumarole domes such as native sulfur, incrustations, and condensates.

This study presents results of geochemical analyses of native sulfur from the fumarolic fields at the volcano Ebeco, Paramushir Island. It was carried out in order to:

(1) evaluate mechanisms of trace elements transport in gas-hydrothermal discharges at the volcano;

(2) determine possible sources of elements in fumaroles.

A wide spectrum of elements was detected in the samples of native sulfur using Synchrotron XRF method, in water extracts from the samples, and in thermal solutions at the volcano by ICP-AES analysis.

Based on the obtained data, statistic analyses together with detailed comparative analyses of native sulfur composition with host andesites and metasomatites compositions the following sources of elements and mechanisms of transport ones in fumaroles can be educed:

1. Host andesites and metasomatites: Ga, Ge, Zr, Nb, Th, U, Cu, Zn which are transported by volcanic gas as aerosol particles.

2. Magmatic fluids: As, Sb, I, Se, Te, Br, Sn, Cs which are transported in a gas phase, such as pure elements, hydrides, sulphides, and halides.

3. Solutions rising throughout the volcanic edifice, interacting with wall rocks, gas phase and are enriched in geochemical barriers: V, Sr, Rb, K, Ca, Y, Fe, Cr, Mn.