GEOCHEMISTRY OF VOLCANOCLASTIC ROCKS OF THE CARPATHIAN NEOGENE FOREDEEP, CZECH REPUBLIC

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Tephra studies are often used for correlations extending across both marine and terrestrial environments. In the Carpathian Foredeep (Czech Republic) volcanoclastics are known in two main stratigraphical levels. The lower occurrence is conventionally connected with the Eggenburgian–Ottnangian boundary, the upper occurrence is situated in Lower Badenian sediments.

Distribution of trace elements including REE was studied along with concentration patterns of major/minor elements in volcanoclastic rocks and glasses. Ratios of selected chemical elements were used as a tool in genetical considerations. Study of volcanic zircons provided new insights into the tephrostratigraphy of the foredeep.

Chemically, the volcanoclastic rocks form a relatively homogenous field corresponding to a single tectonic position — volcanic arc. The SiO_2 vs. Rb or K_2O diagrams of volcanoclastics and glasses show that the rocks studied were primarily derived from calc-alkaline volcanism. In the Ti/Nb vs. SiO_2 diagram the rocks plot in the orogenetic field. The Rb vs. K diagram indicates that all Eggenburgian and most Badenian rocks contain material of acid to intermediate character. The samples from NP 902 and NP 905 drillings are quite different and plot in the field with relatively more basic composition. K/Rb ratios also separate these volcanoclastics. The closest affinity to the rhyolite composition is found in the Eggenburgian rocks from the drillings H-32, PMK-3, PMK-7 and Znojmo, the other samples are classified as rhyodacites to dacites. The Badenian rocks from the NP 902 and NP 905 drillings correspond to rhyolite/rhyodacite. The $CaCO_3$ vs. sum Fe diagram divides Eggenburgian volcanoclastics into two groups: group I includes rocks with a low proportion of sum Fe and belongs to the field of G type rhyolite, group II are rocks which may be classified as rhyolites to rhyodacites with a higher content of Fe. Majority of the Badenian samples belong to the transition between G and W type rhyolites. The degree of mineralogical and geochemical maturity also differs. The Badenian rocks are commonly less mature.

The contents of rare earth elements show a depletion in light REE in all samples and a depletion in heavy REE in the Eggenburgian rocks. The Badenian volcanoclastics have a smoother REE curve with a distinct negative Eu-anomaly. The Sm/Eu, Eu/Gd, La/Yb, La/Sm and LREE/HREE ratios are different in the two stratigraphic levels studied.

Although the Badenian volcanoclastics form a relatively more homogenous sequence than the Eggenburgian rocks, based on geochemical criteria, rocks from the NP 902 and NP 905 drillings can be distinguished from the remaining Badenian volcanoclastics. The different character of these rocks seems to be a regional phenomenon.

Study of lithology and zircon typology enabled to distinguish two horizons of volcanoclastics of Lower Miocene (Eggenburgian/Ottnangian) age. The two horizonts originated as eruptional phases of a stratified magmatic chamber. Substantial typological differences exist between Upper Eggenburgian and Lower Badenian volcanic zircons.

The average radiometric age for Upper Eggenburgian volcanic zircons is 20.3 ± 2.4 Ma and for Lower Badenian volcanic zircons 16.2 ± 2.1 Ma (fission track dating).

A volcanic arc with calc-alkaline volcanism was the source area of the volcanoclastics studied. The source area of Upper Eggenburgian volcanoclastics (Lower Rhyolite tuff) was in today´s northern Hungary. These rocks are a product of aerial type of dacite and rhyolite volcanic activity in the Carpatho-Pannonian region. The Lower Badenian volcanoclastics are a product of differentiation of aerial type of andesite volcanic activity.