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TO THE PROBLEM OF THE METAMORPHISM AGE OF AMPHIBOLITES IN THE RAKOVEC GROUP OF THE GEMERIC FROM KLÁTOV — KOŠICKÁ BELÁ

(Fig. 1)



Abstract: The complex of basic rocks of the Rakovec group from Klátov to Košická Belá — until lately considered as intrusive — is newly interpreted as metamorphosed into the facies of epidote amphibolites. The metamorphic processes are ranged to the boundary between the Jurassic and Cretaceous. The radiometric ages of amphiboles, however, fall to the Early Paleozoic. They testify against the origin of amphibolites during the Alpine orogeny.

Резюме: Комплекс основных пород раковецкой группы от Клатов-Кошицка Бела, который до недавнего времени считали интрузивным и, в последнее время интегрируют как метаморфизованный в фацию эпидотических амфиболитов. При этом, метаморфные процессы относят к границе между юры и мел. Но, радиометрические возрасты амфиболов относятся к старшему палеозою. Свидетельствуют против возникновению амфиболитов в течении альпийского орогенеза.

In the Spišsko-gemerské rudohorie Mts. eruptive rocks are present in the whole Paleozoic profile — from the Cambrosilurian to the Permian. The intensity and character of this volcanism display considerable variability there.

The oldest lithostratigraphic group — the Gelnica group (formerly designated as Porphyroid group, Gelnica group, Cambro—Silurian group) corresponds to the Caledonian stage of development and probable stratigraphic range Cambrian — Lower Devonian. Such ranging is partly evident from the geological position, however, prevailing from palynological investigations (P. Snopková, 1964; O. Čorná, 1972; L. Kamenický, 1976; P. Snopková — L. Snopko, 1979) as far as it is practically sterile in other fossils.

The Gelnica group consists of volcanogenic-sedimentary complexes with richly represented flysch development. Lacking fossils and a complicated lithofacial development render inner subdivision of the Gelnica group difficult. In spite of that subdivision from oldest to younger units into formations is relatively common: the Vlachovo, Bystrý potok and Drnava formations (L. Snopko, 1969).

Characteristic of the Gelnica group is acid volcanism of quartz porphyries, quartz keratophyres, keratophyres and their pyroclastics which are found in all the mentioned formations. The manifestations of basic volcanism are, on the contrary, essentially less represented and less wide-spread.

Relation of metadiabases, epimetamorphosed tuffs and tuffites to metamorphosed products of acid volcanism — porphyroids, mutual transitions at several places testify to common competence of both types of volcanism to the Gelnica group.

Besides metadiabases coarse-crystalline gabbrodiorites are found in places in the Gelnica group. They were considered as chimneys of basic effusives

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of the younger Rakovec group (L. Kamenický — M. Marková, 1957). From Mníšek nad Hnilcom P. Grecula (1964) mentions gradual transitions from coarse-grained gabbrodiorites through diabases to diabase tuffs and tuffites.

He interprets the gabbrodiorite as the centre of the lava flow. J. Ilavský — J. Chmelík (1965) consider gabbrodiorites from Smolník also as effusive bodies of concordant position belonging to the Gelnica group.

Rakovec group — formerly designated as the Rakovec or Phyllite-diabase group. As the name indicates, it is the main domain of basic, — diabase volcanism. Neither its stratigraphic range nor its competence are directly proved paleontologically. Assignment is based on geological position and comparison with analogous lithological development in the Eastern Alps.

According to position below the Lower Carboniferous from Ochtiná, proved by fauna, and overlying the youngest formation of the Gelnica group — the Drnava formation, to which a predominantly Lower Devonian age is ascribed on the basis of palynological investigations — a stratigraphic range Middle to Upper Devonian is supposed in the Rakovec group (L. Snopko et al., 1979).

In the lower part of the Rakovec group predominantly quartzites, quartz phyllites, sericitic quartz phyllites and quite subordinately also metadiabases and their pyroclastic material are present.

The higher part is distinctly volcanogenic. Fine-grained, grained to porphyritic metadiabases predominate, in places spilites and pillow-lavas are found. Metamorphosed diabase tuffs and tuffites are much wide-spread. From basic rocks still gabbrodiorites, quartz diorites, amphibolites take up a significant place. Recently also the presence of serpentinites was found out (I. Dianiška — J. Hurný, 1977).

Scarcer members of the Rakovec group are porphyroids, formed by metamorphism from quartz porphyries and keratophyres, representing acid differentiates of basic volcanism (Š. Bajaník, 1969).

Numerous authors were dealing with the geological and petrographic problem of basics of the Rakovec group. From newer we are finding more comprehensive data in the works by L. Kamenický — M. Marková (l.c.); L. Rozložník (1961, 1965); Š. Bajaník (1969, 1975, 1976), I. Dianiška — P. Grecula (1979) and others.

There are great differences between volcanism of the Gelnica and Rakovec group. It is, however, necessary to emphasize that the above mentioned stratigraphic ranging and subdivision are not generally accepted. P. Grecula (1973) considers the Gelnica group as the only representative of Early Paleozoic complexes in the Spišsko-gemerské rudohorie Mts. In his conception the Rakovec group represents a development only lithologically and volcanologically somewhat different, however, synchronous with the Gelnica group.

A serious problem is the position of the Črmeľ group in the easternmost part of the Spišsko-gemerské rudohorie Mts., its stratigraphic ranging and relation to other groups. Clearing up of geological development, tectonics, metamorphic processes etc. mainly in Early Paleozoic complexes depends upon further detailed investigation of the area.

Till recently all data indicated a low grade metamorphism of the Early Paleozoic complexes into the green schist facies. Its age was derived from the

Variscan (J. Kamenický — E. Krist, 1969) or Alpine orogeny (I. Varga 1973).

Metamorphites of amphibolite facies, amophibolites and gneisses, originated from rocks of the Rakovec group by granitization processes of Variscan age were described first from the area of Dobšiná (L. Rozložník, 1965).

Later, with exploration of the Rurňany deposit, intrusive rocks — quartz diorites to ultrabasics were found, which penetrate to the Carboniferous (M. Mandáková et al., 1971). These are considered (J. Popreňák et al., 1973) as products of higher — grade metamorphism of Alpine age, which affected rocks of the Rakovec group as well as of the Carboniferous.

D. Hovorka et al. (1979) was dealing in detail with geology and petrography of the mentioned rocks from Rudňany. According to them the complex of amphibolites and gneisses always occurs concordantly in the Carboniferous sequence. Amphibolic rocks are represented by amphibolites s. s., garnet, zoisite, ophthalmitic amphibolites. From gneisses they mention: biotite plagioclase paragneisses, garnet-biotitic plagioclase paragneisses, garnet-amphibole-biotitic plagioclase paragneisses and muscovitic paragneisses. The metamorphic throw between surrounding rocks of greenschist facies and amphibolite-gneiss complex metamorphosed to low-temperature subfacies of amphibolite facies is explained by selective metamorphism under favourable conditions. The age of metamorphism has not been established unambiguously. The authors consider its assignment to the Variscan cycle as more probable.

Amphibolic rocks are largely represented also in the easternmost part of the Spišsko-gemerské rudohorie Mts., in the Rakovec group between the villages Nižný Klátov and Košická Belá, north of Košice. (Text — fig. 1).

According to L. Kamenický — M. Marková (l.c.), who were dealing systematically with petrography of basics of the Rakovec group, the types of rocks near Dobšiná and Klátov are very similar. From the latter locality they mention: amphibolic gabbro (in a large body, almost 10 km long and more than 1 km wide) and its acid and more basic products of differentiation, quartz diorites, gabbroaprites, gabbropegmatites, melanocratic amphibolic gabbro, further amphibole-biotitic diorites, which are considered as early post-tectonic, younger than amphibolic gabbro. On the contrary to L. Rozložník (l. c.) they consider the rocks from Klátov as intrusive].

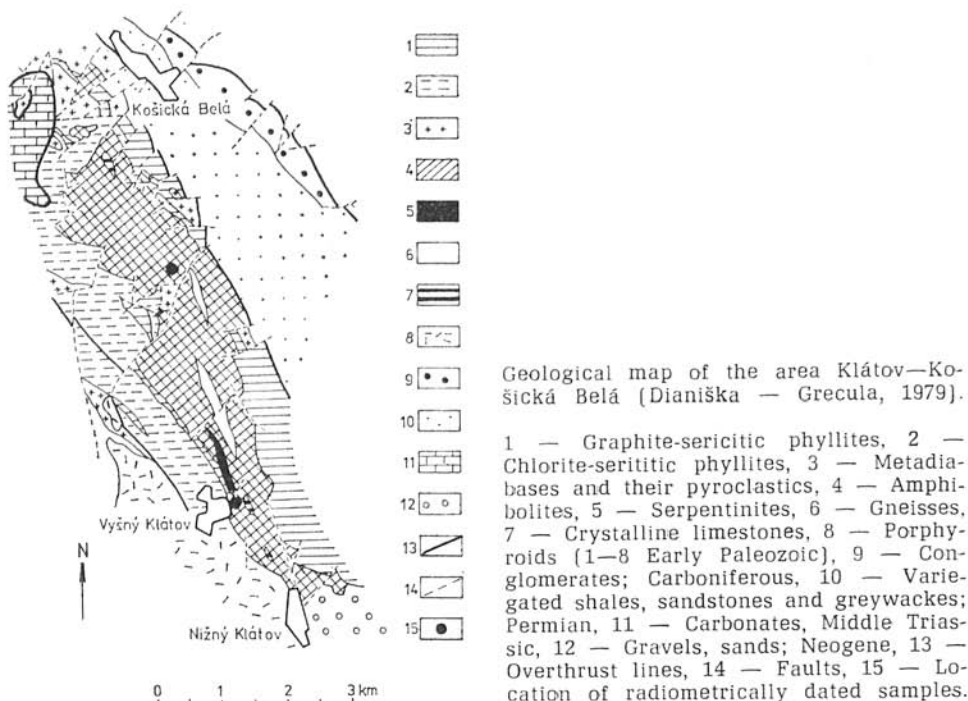
The latest data on this area come from I. Dianiška — P. Grecula (1979), who studied and published this problem in the frame of the IGCP programme of UNESCO, Project No. 5. Prevariscan and Variscan events in the Alpine — Mediterranean mountain belts. The geological structure is interpreted by superposition of two partial nappes of the Gemeric, the lower — Rakovec and upper — Gelnica nappes. In the Rakovec nappe metamorphism reaches the facies of epidote amphibolites.

The so called amphibolite—gneiss complex consisting of amphibolites, which are not subdivided more in detail from petrographic side, as well as of thin layers of biotitic, biotite-amphibolic and amphibole-plagioclase paragneisses, essentially takes up the whole intrusive Klátov body of L. Kamenický (1975).

I. Dianiška — P. Grecula (l. c.) consider two alternatives in timing of metamorphism of volcanic-sedimentary rocks to the facies of epidote amphibolites (to the gneiss-amphibolite complex):

1. Permian — in connection with granites of equal age. In the case given they necessarily suppose metamorphism of diabase rocks to amphibolites already in form of roches pebbles as pebbles of amphibolites are found in Rudňany already in Carboniferous conglomerates.

2. The Jurassic—Cretaceous period of granitization with compression of the West Carpathian sedimentation area, movement of lithospheric blocks etc. They consider this as most probable for metamorphism of diabase effusive and pyroclastic rocks of the Rakovec group in the area of Klátov to the facies of epidote amphibolites.



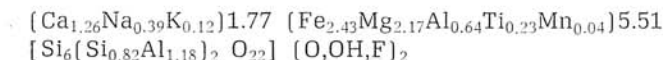
The views of individual authors on position of basic rocks in the Rakovec group, mainly on amphibolic types or members of epidote-amphibolic metamorphic facies are very contradictory. This is also valid of their time ranging. A problem is concerned there, which is of extraordinary importance from the viewpoint of correct interpretation of geological development of the Gemeric.

For the mentioned reason we carried out radiometric dating of amphibolites from the Klátov zone. Monomineralic fractions of amphibole belonging to minerals with highest retentivity of argon were used. With $^{40}\text{Ar}/^{40}\text{K}$ — method two samples from Vyšný Klátov and one from the southern surroundings of Košícká Belá were dated (Text—fig. 1.).

According to microprobe analyses amphibole from the same amphibole from Košická Belá as sample 211 displays chemical composition:

SiO ₂	46,50 %
TiO ₂	2,04
Al ₂ O ₃	10,54
FeO + Fe ₂ O ₃	19,80
MgO	10,08
MnO	0,29
CaO	8,02
Na ₂ O	1,36
K ₂ O	0,65

The formula corresponds to it:



Chemical composition of amphiboles is, however, variable in the frame of the Klátov body.

The preliminary results of dating, which we intend to complete and extend in the next:

No.	Locality	k (%)	⁴⁰ A(10 ⁻⁶ Nccm.g ⁻¹)	t(10 ⁶ r)
217	Vyšný Klátov	0,261 ± 0,01	4,429 ± 0,063	391 ± 18
218	Vyšný Klátov	0,244 ± 0,01	4,820 ± 0,090	448 ± 23
211	Košická Belá	0,339 ± 0,01	5,535 ± 0,092	337 ± 16

The radiometric ages display a relatively great dispersion of values partly resulting from geological processes, influencing the samples, partly also from relatively low contents of potassium, inhomogeneity etc. All are Prae-Carboniferous.

These results we may interpret best that there are — in accordance with geological observations — basics of Early Paleozoic age. If they represented metamorphic products in the facies of epidote amphibolites, then there could have been a relatively short difference in time between the time of intrusions and metamorphism only.

Radiometric dating is also in accordance with the finding of amphibolite pebbles in the Bindt—Rudňany conglomerates of Carboniferous age near Rudňany.

The conclusion from IGCP Project No. 5 of UNESCO on the Alpine age of metamorphism of the Rakovec group (I. Dianiška — P. Grecula l.c.) to the facies of epidote amphibolites cannot be considered as substantiated.

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