stacking and implies that the present tectonic structure of the E margin of the Bohemian Massif was finalized between the Upper Visean and Stephanian.

This research was supported by the GAČR project No 205/99/0567 and research project CZ:J07/98:143100004.

References

KOTKOVÁ J. and PARRISH R.R., 2000. Evidence for high exhumation rate in Central European Variscides: U-Pb ages of granulite metamorphism of clasts deposited in Upper Visean conglomerates. *Geolines*, 10: 41-42.

Alpine Metamorphism in the Veporicum Unit: Differences in Reaction Mechanisms between Basement and Overlaying Sediments (Inner Western Carpathians)

Martin KOVÁČIK

Štátny Geologický ústav D. Štúra, Mlynská dolina 1, 817 04 Bratislava, Slovakia

The lower metamorphic grade of the clastic Upper Paleozoic--Mesozoic cover sediments in comparison to the Alpine reworking of the basement rocks was apparent a long time ago. However, this fact did not have to necesarilly reflect considerably different metamorphic condition, as suggested by Vrána (1966). Another interpretation of the different Alpine metamorphic assemblages in the basement and the cover sediments is based on a metamorphic zoning of rock pile, composed of the corresponding Veporicum, Gemericum and ultra-Gemericum Units (Plašienka et al. 1999). In the basement metapelites, regionally metamorphosed under prevailing amphibolite facies conditions in the Hercynian time (e.g., Zoubek, 1936), locally newly-formed garnet (enriched in grossularite component), staurolite, kyanite and tschermakitic amphibole have developed, thus reflecting peak conditions of the Alpine regional metamorphism of barrovian type (Vrána 1966, 1980; Méres and Hovorka, 1991; Kováčik et al., 1996, 1997). Absence of these higher-grade metamorphic assemblages in the Permian-Triassic clastic beds was explained by monotonous lithology of the cover rocks (Vrána, 1966). Petrographic observations on regional scale showed that the Alpine metamorphism did not establish equilibrium in the cover metasediments, as the clastic micas, plagioclase, K-feldspar are commonly preserved, and the argilliferous matrix is also frequently poorly recrystallized. Similarly, the Hercynian basement metamorphic assemblages were entirely replaced by the Alpine mineral assemblages only scarcely. Prevailing regional mineral transformations in the basement metapelites include: replacement of pre-Alpine garnet (almandine-spessartine-pyrope) by chlorite, biotite and local grossular-rich rims; chloritization or recrystallization of biotite in fine-grained biotitie mass; sericitization of plagioclase; decomposition of staurolite (or rare Al-silicates) giving rise to white micas and chloritoide. Amphibolites are retrogressed in this manner: chloritization, biotitization, epidotization, silicification, albitization and the pre-Alpine Ca-amphiboles are transformed into actinolitic types.

In the overlaying Alpine units lithologic types of similar bulk-composition as within the basement metamorphites also occur. For example, metamorphic growths of white micas, chloritoide and rare kyanite (Vrána, 1964) are mainly linked to lithologies rich in pelitic compound, which occurred in the overthrust Gemericum Carboniferous Unit (s.l.) and sometimes in the Veporicum Permian cover-rocks. The absence of the highest grade Alpine metamorphic minerals – staurolite, garnet, (biotite) - could have been caused by a higher water content in these sediments, which were not enough dehydrated prior to the Alpine metamorphism. In the Alpine times, these rocks underwent progressive metamorphism, whereas the prior thermally reworked basement rocks suffered only retrograde metamorphism by means of fluid influx (mainly hydration).

Metamorphic crystallization of "wet" sediments run by means of dehydration reactions, which generally show endothermic effects (Bucher and Frey, 1994). Such a need of heat may induce a certain lag of metamorphic reactions path in the sediments. On the contrary, hydration-type of reactions taking part in alterations of "dry" basement mineral assemblages show exothermic effects. From this point of view, it is necessary to expend less amount of heat for the formation of Alpine mineral assemblages in the basement than for the adequate metamorphic reactions in the overlaying (meta)sediments.

References

BUCHER K. and FREY M., 1994. Petrogenesis of Metamorphic Rocks. Springer Verlag, Berlin.

KOVÁČIK M., KRÁĽ J. and MALUSKI H., 1996. Alpínsky metamorfný a termochronologický vývoj juhoveporických predalpínskych metamorfitov. *Miner. Slovaca.*, 28: 185-202.

KOVÁČIK M., KRÁĽ J. and MALUSKI H., 1997. Alpine reactivation of the southern Veporicum basement: metamorphism, 40Ar/39Ar dating, geodynamic model and correlation aspects with the Eastern Alps. In: P. GRECULA, D. HOVORKA and M. PUTIŠ (Editors), Geological evolution of the Western Carparhians. Miner. Slovaca-Monogr., pp.163-174.

MÉRES Š. and HOVORKA D., 1991. Alpine metamorphic recrystallization of the pre-Carboniferous metapelites of the Kohút crystalline complex (the Western Carpathians). *Miner. slovaca*, 23: 435-442.

PLAŠIENKA D., JANÁK M., LUPTÁK B., MILOVSKÝ R. and FREY M., 1999. Kinematics and Metamorphism of a Cretaceous Core Complex: the Veporic Unit of the Western Carpathians. *Phys. Chem. Earth*, 24: 651-658.

VRÁNA S., 1964. Chloritoid and kyanite zone of alpine metamorphism on the boundary of the Veporides and the Gemerides. *Krystalinikum*, 2: 125-143.

VRÁNA S., 1966. Alpidische Metamorphose der Granitoide und der Foederata-serie im Mittelteil der Veporiden. *Zbor. geol. vied, rad ZK*, 6: 29-84.

VRÁNA S., 1980. Newly formed Alpine garnets in metagranitoids of the Veporides in relation to the structure of the Central zone of the West Carpathians. *Eas. miner. geol.*, 25: 41-54.

ZOUBEK V., 1936. Poznámky o krystaliniku Západních Karpat. *Věstník SGÚ*, 12: 207-237.