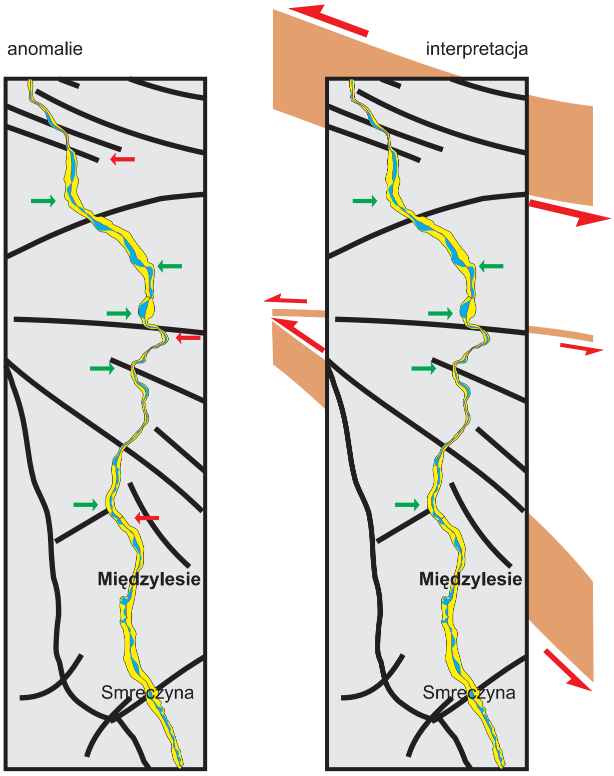

Fig. 4. Structural interpretation of the anomaly of the Nysa Kłodzka River valley (bend 1,0–15 km)

these anomalies is counter clockwise translation in the same direction as the orientation of the fault zones. Dimensions of the translation differ for individual anomalies range from 50 to some 200 m (Fig. 3).

A high efficiency of such corrections of distinguished anomalies suggests that a possible cause of anomalies' formation could have been counter clockwise shifts in the ground, which the Nysa Kłodzka Valley had been developed on. In the same way the correction made enables to reflect the geodynamic activity of the ground of the Upper Nysa Kłodzka in the period, when the lowest recent valley terrace of the Nysa Kłodzka was created (Fig. 4). As this terrace is covered with muddy flood sediments, dated about 800 to 900 years B.P. and is connected to mass timber production on this area, it must have been created in the time prior to this period. In the literature predominates an opinion that the time of formation as well as morphologic stability of the river valley bedforms ranges usually between 1,000 and 100,000 years (e.g. Schumm, 1985; Leeder, 1993; Miall, 1996), as a consequence it should be expected that the velocity of horizontal displacements of the basement during the formation of the Nysa Kłodzka Valley should vary between 25 cm (?!) and 0.5 mm per year. Whereas, the former value is absolutely wrong, the latter one seems to be probable and close to the current neo-tectonic displacements being evidenced for the Nysa Trough area.

It should be, however emphasised that some of anomalies found out in the upper segment of the Nysa Kłodzka River can also be induced by human activity. For sure, however, significant influence of structural anisotropy of the basement as well as differentiation of lithology can be excluded.

References

AUGUST C., AWDANKIEWICZ M., WOJEWODA J., 1995. Trzeciorzędowe bazaltoidy, wulkanoklastyki i serie osadowe wschodniej części bloku przedsudeckiego. (in Polish, English summary). Przewodnik do LXVI Zjazdu PTG, pp. 241-254.

LEEDER, M.R., 1993. Tectonic controls upon drainage basin development, river channel migration and alluvial architecture: implications for hydrocarbon reservoir development and characterization. In: North C.P., Prosser D.J., (Editors), Characterization of fluvial and aeolian reservoirs. Geol. Soc. London Sopec. Publ., 73, pp. 7-22.

MASTALERZ K., WOJEWODA J., 1993. Alluvial-fan sedimentation along an active strike-slip fault: Plio-Pleistocene PreKaczawa fan, SW Poland. Spec. Publs Int. Ass. Sediment. (1993) 17, 293-304.

MIALL A.D., 1996. The Geology of Fluvial Deposits. Springer-Verlag, Berlin.

SCHUMM S.A., 1985. Patterns of aluvial rivers. *Ann. Rev. Earth Planet Sci.*, 13: 5-27.

WOJEWODA, J., MIGOŃ, P., KRZYSZKOWSKI, D., 1995. Rozwój rzeźby i srodowisk sedymentacji w młodszym trzeciorzeciorzędzie i starszym plejstocenie na obszarze środkowej części bloku przedsudeckiego: wybrane aspekty. (in Polish, English summary). Przewodnik do LXVI Zjazdu PTG, pp. 315-331.

WOJEWODA J., 2003. Tensional evolution of the Złotoryja-Jawor zone in Neogenie. (in Polish, English summary). In: Ciężkowski W., Wojewoda, J. & Żelaźniewicz, A. [Editors] – Sudety Zachodnie: od wendu do czwartorzędu, 127-136, WIND, Wrocław

Are the Malé Karpaty Mts. Composed From Three Granite Massifs?

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Granitic rocks of the Malé Karpaty Mts. are generally divided into two groups: Bratislava and Modra Massif. Lower Carboniferous granite/granodiorite of Bratislava Massif showing affinity to S- type granitic rocks and Upper Carboniferous granodiorite/tonalite of Modra Massif, considered as the I-type granitic rocks (Vilinovič, 1981; Cambel et al., 1982a). Granitic rocks of the Modra Massif forms two bodies in tectonic position, divided with thin belt of Triassic quartzites.

The present study showed three different accessory mineral assemblages in the granitic rocks of the Malé Karpaty Mts. Typical S-type assemblage – apatite, garnet, zircon and monazite is present in the granites of Bratislava Massif. Magnetite, epidot-zoisite, apatite and zircon are typical accessory minerals for the northern part of Modra Massif, and epidot-zoisite, dusky apatite, ilmenite and zircon form the accessory minerals assemblage of the southern part of the Modra Massif . While the assemblage of the northern Modra Massif part is typical I-type granite assemblage of the Western Carpathians which is confirmed also by zircon typology, showing parameters I. A. ≈ 310 and I. T. ≈ 365 (Broska and Uher, 1991), accessory minerals of the southern part show probably not simple I-type character of these granites. Lower typological parameters of zircon (I. A. ≈ 325 and I. T. ≈ 300), but mainly the presence of dusky apatite and ilmenite and absence of magnetite, indicate mixed I/S-type character of the southern part of the Modra granite massif. Dusky apatite is considered as a product of magma contamination and assimilation in the Modra Massif (Mišík, 1955, Dyda, 1976). Broska et al. (1992) consider the presence of dusky apatite as the indicator of reducing conditions in parental magma. This reason is more presumable in this case, as the ilmenite crystallized in these rocks instead magnetite (Zahradník, 2003).

Although no significant differences are visible from geochemical studies between the northern and southern parts, discrepancies within the accessory mineral paragenesis are so distinct, that they clearly indicate different magma evolution of these two Modra Massif parts.

Taken into account, that the results of electron probe dating of monazite indicates the important time gap in the formation of the northern and southern parts of these Modra granite bodies, the comagmatic relationship between these plutons seems to be excluded. Formation of granitic rocks of the southern part of Modra Massif shows age 345 ± 22 Ma (Finger et al., 2003), on the other hand granitic rocks of the northern part of Modra Massif are significantly older, 385 ± 22 Ma. The formation of the Bratislava massif is close to the southern part of the Modra Masif 355 ± 18 Ma.

Various types of pegmatoid and aplitic derivatives are relatively common in the southern part of Modra Massif, including syenitic rocks formed in processes of filter pressing and/or flowage differentiation in late-magmatic granitic dykes (Zahradník, 2003), while products of Na-autometasomatism - albitites are present in the northern part (Cambel et al., 1982).

Preliminary results of the study of granitic rocks of the Malé Karpaty Mts. indicate the presence of three independent granitic bodies. Besides Bratislava massif with S-type affinity, different ages and differentiation trends of both bodies in Modra massif could distinguish the two granitic bodies of the Modra massif: Modra massif s.s. (southern part) and Baďurka massif (northern part). Further research, including field, geochemical and mineralogical study as well as geochronological dating, is however necessary to confirm these results.

References

BROSKA I. and UHER P, 1991. Regional typology of zircon and its relationship to allanite/monazite antagonism (on an example of Hercynian granitoids of Western Carpathians). *Geol. Carpath.,* 42: 271-277.

BROSKA I., DIKOV Y., CHELKOVA A. and MOKHOV A. V., 1992. Dusky apatite from the variscan granitoids of the Western Carpathians. *Geol. Carpath.,* 43: 195-198.

CAMBEL B., VESELSKÝ J. and MIKLÓŠ J., 1982. The Malé Karpaty rocks altered by metasomatism. *Geol. Zbor. Geol. Carpath.,* 33: 697-728.

DYDA M., 1976. Apatite morphology in the granitic rocks of the Malé Karpaty Mts. (in Slovak). *Miner. Slov.,* 8: 475-480.

FINGER F., BROSKA I., HAUNSCHMID B., HRASKO L., KOHÚT M., KRENN E., PETRÍK I., RIEGLER G. and UHER P., 2003. Electron-microprobe dating of monazites from Western Carpathian basement granitoids: plutonic evidence for an important Permian rifting event subsequent to Variscan crustal anatexis. *Int. J. Earth Sci.*, 92: 86-98.

MIŠÍK M., 1955. Accessory minerals of the Malé Karpaty granitic massifs (in Slovak). *Geol. Sbor.,* VI: 161-174.

VILINOVIČ V., 1981. Granitoids of the Malé Karpaty Mts.: Petrochemical classification and crystallization path. *Geol. Zbor. Geol. Carpath.,* 32: 489-503.

ZAHRADNÍK L., 2003. Fractionation of the granitoids of Modra massif in the area of Modra – Harmónia (in Slovak). MSc. thesis. Faculty of Natural Sciences, Comenius University. Bratislava.

Differential Exhumation in an Orogenic Root Domain: Snieznik Dome

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The structural and metamorphic evolution was investigated in two E-W oriented sections in the central part of the Orlica-Snieznik domain in order to understand mechanisms of exhumation of lower- and middle-crustal rocks in an orogenic root domain. The studied profile crosscuts from the west to the east NE-SW oriented belt of eclogite lenses within orthogneiss and a belt of volcano-sedimentary Stronie group. The orthogneiss shows Cambro-Ordovician protolith ages and Variscan metamorphism and anatexis, eclogites experienced metamorphic conditions of c. 800 °C and 18 kbar (with suspicion for UHP metamorphism) and the Stronie group is affected by medium-grade metamorphism.

In the northern profile the oldest fabric with probable subhorizontal orientation is characterized by HT monomineral banding of the orthogneiss and lithological banding and metamorphic foliation within metasediments of the Stronie group. It is folded by west-vergent open to close folds with N-S subhorizontal axis and axial planes dipping under steep angles to the