small variations of heavy minerals. They contain white mica (14 %), clinozoisite (14 %), Ti minerals (sphen and rutile 40 %) and, only subordinately, biotite, garnet, apatite and turmaline. Sample J3 from Jedlina Zdrój has a wider spectrum of minerals, including abundant chlorite (50 %), white mica (11 %), clinozoisite (10 %) and minor epidote, biotite, garnet and Ti phases. The difference between heavy mineral spectra in the sediments of the Wałbrzych and Jedlina Zdrój area may reflect the influence of volcanic activity in the vicinity of Wałbrzych at that time.

Summary

The heavy mineral spectra of the Wałbrzych Formation and Biały Kamień Member consist mainly of opaques (hematite and ilmenite), while transparent minerals are represented by white mica (flaky aggregates of colourless and greenish mica and chlorite), epidote, clinozoisite and Ti minerals (rutile, sphene, brookite and occasionally anatase).

Comparing the new results with data coming from the Lower Carboniferous sediments (Felicka 1997 a, b) it appears that the Upper Carboniferous deposits contain more Ti minerals and less mica (white mica, chlorite and biotite), while the contents of epidote-clinozoisite and garnet is generally the same.

Based on the results of heavy mineral analysis, it is difficult to determine the source areas for the analysed sediments because of a rather small number of samples, their considerable variation and the lack of microprobe analyses. Most of the material could have come from the redeposition of Lower Carboniferous deposits and sedimentary rocks similar to those exposed in the Świebodzice Depression; transport from the Sowie Mts. is still unlikely because of the lack of some indicative minerals such as kyanite and sillimanite.

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Fault-propagation Fold and Thrust Tectonics of the Upper Silesian Coal Basin

Radomír GRYGAR[1], Jiří PTÁČEK[2] and Petr WELSER[3]

[1] *Institute of Geological Engineering, VŠB - Technical University Ostrava, 17. listopadu, 708 33 Ostrava, Czech Republic*
[2] *DPB Paskov - Underground Exploration and Mine Safety, Inc., Paskov, Czech Republic*
[3] *Paskov Mine, Paskov, Czech Republic*

From the stratigraphical point of view The Upper Silesian Coal Basin (USCB) sedimentary sequence represents the uppermost (Namurian A – Westphalian B) levels and, from the structural and deformation polarity point of view, the outermost zone of the Moravo-Silesian region of the Bohemian Massif. In this area, the Variscan accretion wedge tapers out and the Variscan collision deformations progressively but slowly disappears. Almost all authors define the longitudinal (NNE-SSW) Orlová fold-thrust structure as an easternmost (which in this case contemporaneously mean outermost) limit of late Variscan "folding" of the Variscan foreland foredeep and coal-bearing molasses. The continental molasses of the Karviná formation, outcropping eastwards of the Orlová structure were, or by some authors still are, considered as the post-erosion and post-deformational sedimentary sequence, affected only by normal faulting.

Our recent structural studies in the Czech part of USCB verified relatively extended thrusting (the thrusts mostly striking NE-SW up to NNE-SSW) more then 7-10 km eastwards from the Orlová fold-thrust structure. These mostly flat lying thrusts, were recorded in the seams of the Saddle member on the 9. květen Mine and also in the stratigraphically identical seams of the 5th. block of the Darkov Mine, more north-eastward from the Karviná graben. In higher seams of the Suchá Member (above all in its upper part) these thrust systems disappear, which together with their listric geometry indicate imbricated upward-blinding thrust systems of the outermost apical domain of the Variscan accretion wedge (Grygar et al. 1996, 1997). The vertical amplitude of these thrusts does not overreach first meters. This structure is clearly related to the major deeper-level detachment fault of the accretion prism.

In a SW part of the easternmost excavated areas of the Paskov Mine we have studied similar fault-related fold and thrust imbricated systems with the NE-SW to NNE-SSW orientation and typical listric geometry (Grygar et al. 1997, Welser 1998). In addition, Foldyna et al. (1982) presented cross-sections with the very similar flat geometry of the Michálkovice fold-thrust structure. Nearly the same is valid for the Polish part of the USCB (e.g. Kotas 1983).

All these systems are genetically related to an extensive layer parallel faulting and flexure-slip deformation mechanism, predetermined by typical lithology of the coal-bearing molasses and flysch foredeep sediments with high layer-parallel anisotropy. Also our studies more westwards in the Upper Visean flysch facies of the Kyjovice Member indicate the same tectonic style of the fault-propagation fold in the sense of e.g. Mitra (1990).

On the basis of the above presented investigations and many others unpublished colliery reports we came to the conclusion, that both main fold-thrust (Michálkovice and Orlová) structures of the USCB correspond to the **fault-propagation fold** type genetically related to the detachment thrusts on the base of the Variscan accretion wedge. This major thrusting was in early stage syngenetic in relation to the coal-bearing molasses sedimentation (compare with the intra-Namurian hiatus – e.g. Dopita et al. 1997) and continued up to the Westphalian B and/or later. This conclusion is supported by the fact, that the deformation are affecting likewise the Saddle and Suchá Members (Westphalian B) of the Karviná Formation, as postulated above.

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The Brno Massif: A Section through an Active Continental Margin

Pavel HANŽL[1] and Rostislav MELICHAR[2]

[1] *Czech Geological Survey, Leitnerova 22, 658 69 Brno, Czech Republic*
[2] *Rostislav Melichar, Faculty of Sciences, Masaryk University, Kotlářská 2, 611 37 Brno, Czech Republic*

The Brno Massif is a body composed of the Cadomian East and West granodiorite areas which are tectonically separated by the Metabasite Zone of the Lower Palaeozoic ?/Upper Proterozoic? age. Both the granodiorite areas are formed by calc-alkaline metaluminous rocks but they slightly differ in their composition and orientation of small scale structures. The East area is composed of granodiorites and tonalites representing plutonic rocks of a primitive volcanic arc. The West area is formed by granites, granodiorites and tonalites representing more evolved rocks of a volcanic arc or an active continental margin. Many relics of wall rocks are preserved here. Metasediments prevail in the NW-SE oriented narrow belts farther to the west. Calc-alkaline mafic and ultramafic rocks form a relatively independent N-S oriented "diorite belt" along the eastern margin of the area. The Metabasite Zone consists of a bimodal volcanic association metamorphosed in the greenschist facies conditions. The prevailing basalts have the composition similar to that of MORB.

Both the granodiorite areas were brought together along the Metabasite Zone during the older east vergent thrusting that was strongly reworked by sinistral strike slips later. The age of these events is supposed to be Variscan because of the incorporation of the Lower Devonian clastic sediments ("Old Red") and the Givetian limestones of the Babí lom Zone into the structure of the Metabasite Zone.

The Brno massif could represent a profile through the Cadomian active continental margin with the maturity increasing from the east to the west and it is possible to interpret the Metabasite Zone as a relic of a back arc basin. All these parts as the separate terranes were brought together during the Variscan orogeny.

References

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	LITHOLOGY			
	granite, granodiorite, diorite, paragneiss, migmatite, calc - silicate rock	diorite, ultramafite	basalt, rhyolite	granodiorite
Zapletal (1928. 1929a,b)	WESTERN AREA SOUTHERN AREA	CENTRAL BASIC BELT iorite elt	dia ase elt	EASTERN AREA
Weiss in Svoboda et al. (1964)	WESTERN AREA	CENTRAL BASIC BELT	metabasite zone	EASTERN AREA
Weiss in Štelcl, Weiss (1986)	WESTERN GRANODIORITE ZONE	METABASITE ZONE meta iorite subzone	metadiabase subzone	EASTERN GRANODIORITE ZONE
Mitrenga, Rejl (1993)	BOBRAVA AREA	METABASITE ZONE AREA		SVITAVA AREA
Hanžl, Melichar (1997)	WEST GRANODIORITE AREA	diorite belt	METABASITE ZONE	EAST GRANODI RITE AREA

Tab. 1. Review of terminology and classification of the individual parts of the Brno Massif. According to Hanžl and Melichar (1997).