Structure and Petrology of the Western Part of the Meliata Unit, West Carpathians

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The Meliata Unit with bluschist facies metamorphic rocks, exposed in the western part of the Gemericum, occurs in several localities around the Štítnik and Nižná Slaná area. It forms tectonic slices overlying the early Paleozoic greenschist facies sedimentary and volcanic rocks with late Paleozoic metaconglomerates and also occurs beneath the unmetamorphosed or very low-grade metamorphosed Silica (Turna) Nappe formed mostly by limestones and dolomites. The Meliata and related rocks can be subdivided into two even three (upper, middle and lower) tectonic sheets. The most common rocks of the upper sheet are marbles with lenses of metabasite, different varieties of phyllites and rarely micaschists. Marble is pure calcitic, but at the contact with metabasites or phyllites it may contain amphiboles (glaucophane or actinolite), epidote and micas. The blueschist facies minerals in metabasites are glaucophane, epidote, albite, titanite and locally also garnet. Fine-grained, black phyllites, exposed on the basis of marbles are characterized by the presence of long (up to 1 cm) glaucophane crystals that cross cut the foliation and they are mostly replaced by chlorite and Fe-oxide (limonite). In some cases, brown colored mixed layered silicate of chlorite with mica is also present. Some of these glucophane-bearing phyllites may contain also chloritoid. The micaschists of the upper sheet occur between Nižná Slaná and Hankova and they are characterized by the presence of large (up to 5 cm) columnar crystals that have random orientation. The spectacular large crystals are formed either by pseudomorphs of chlorite with relicts of hornblende or by glaucophane. The rock with hornblende has relatively high amount of epidote (10 vol%), which mostly form inclusions in white mica. The studied micaschists occur adjacent to mafic blueschists, but their contact is not exposed. Minerals present in the blueschists are glaucophane, epidote, albite and chlorite. Some phyllites additionally contain quartz, phengite and rarely also paragonite and garnet. The middle sheet rocks are phyllites with chloritoid, although without glaucophane. They are exposed only locally, but lithologically correspond well to those in the eastern part of the Meliata Unit and are called the lower complex underlying marbles and blueschists. Chloritoid forms porphyroblasts in the fine-grained matrix and crosses cut the foliation. The lower sheet rocks are represented by the Permian conglomerates which are strongly deformed and show similar microstructural features as that in the middle and upper sheets. Compared to the upper and middle sheet rocks these rocks indicate very low-grade metamorphic conditions. Four deformation events were recognized in the studied area. The oldest deformation event (D1) was identified only locally in metabasites and it is characterized by the development of moderately east dipping metamorphic foliation bearing HP mineral assemblage. This foliation is transposed into a new metamorphic foliation showing retrogression features during the second deformation event (D2). The second deformation fabric is sub-parallel to the S1 and dips to the SE at medium angles bearing generally WNW-ESE trending lineation defined by shape preferred orientation of micas. The third deformation event (D3) is characterized by the development of large scale folds as well as small scale kink bands with steep N-S trending axial planes and subhorizontal NNE-SSW trending axes. This event shows westward shear senses and it is probably related to the late stage buttressing following the exhumation of the Meliata Unit. The forth deformation event (D4) related to Cretaceous deformation described also in adjacent Units is represented by the development of folds and kink bands with steep WSW-ENE trending axial planes and axes dipping at moderate angles to the NW. The folds and kink bands of the last two deformation events affect highly anisotropic phyllites and metaconglomerates preferentially.

The Zázrivá Fault – Paleostress History and Kinematics (Pieniny Klippen Belt, North Slovakia)

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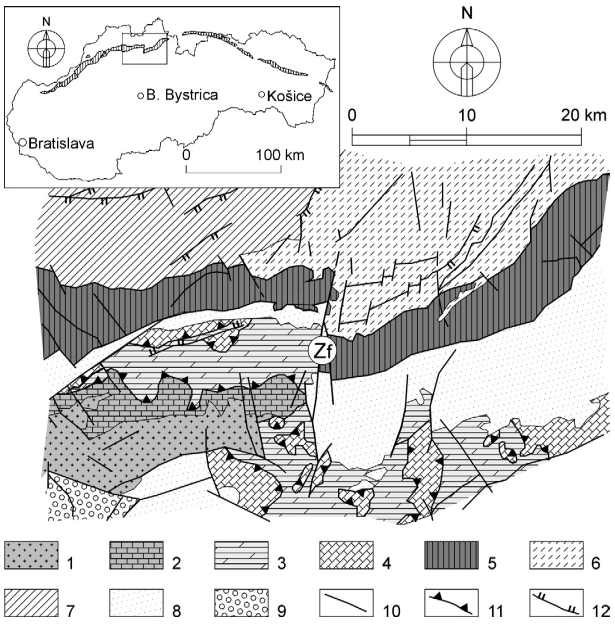
The Zázrivá fault is N-S trending discontinuity distinctively affecting the northern part of the Pieniny Klippen Belt in the Orava area of the Western Carpathians (Fig. 1). It is a part of the first order fault zone cutting whole structure of the Western Carpathians, even Panonian region traditionally called Zázrivá-Budapest fault. The Zazrivá fault represents the northernmost structural expression of the Central Slovak fault system (Kováč and Hók 1993, Nemčok 1994, Nemčok and Nemčok 1998).

The structural records of the Zázrivá fault activity were observed and analyzed at available outcrops in the vicinity of the Zázrivá and Istebné village. The structures were observed along the damage zone of the Zázrivá fault in the Outer Carpathians,



■ **Fig. 1.** Location of the Zázrivá fault and idealised tectonic sketch (according to Biely et al. 1996, modified). 1 – Crystalline basement of the Tatric Unit; 2 – Tatric sedimentary cover; 3 – Fatric Unit (Krížna nappe); 4 – Hronic Unit (Choč nappe); 5 – Pieniny Klippen Belt; 6 – Krynica Unit; 7 – Bystrica Unit; 8 – Central Carpathian Paleogene Basin sediments; 9 – Neogene sedimentary rocks; 10 – Faults; 11 – First order overthrust lines; 12 – Second order overthrust lines; Zf – Zázrivá fault.

Pieniny Klippen Belt and Central Carpathians units. Attention was focussed to the brittle deformations – slickensides, as well as tensional structures (veins, tension gashes) to reconstruct paleostress evolution within the area of interest.

Four paleostress fault-related events have been reconstructed. Thanks to the various age of fault-bearing rocks (from the Triassic up to the Middle Eocene) the approximate age and superposition of computed paleostress events were possible to establish there.

As the oldest one seems to be NW-SE compressional event followed by N-S, NE-SW compressional events and WNW-ESE, NNW-SSE tensional event. WNW-ESE tensional event was probably complementary one to the NE-SW compressional event. All detected tectonic events characterized by different paleostress fields and structural records are regarded to be the post-Eocene. They are very probably products of the young Tertiary tectonic activity. In recognized stress fields, the kinematic activity of the Zázrivá fault has been verified and model of Zázrivá fault tectonic evolution has been submitted.

The oldest period of tectonic evolution recorded by small-scale structures was NW-SE compression (Oligocene-Early Miocene). The dextral shearing along the E-W trending segment of the Pieniny Klippen Belt in the area of interest is related to this tectonic event.

N-S compression (Early-Middle Miocene), with frequent structural records was responsible for backthrusting tectonics affecting the whole structure of the contact zone in between Outer and Central Western Carpathians (Marko et al. 2005). Nevertheless, N-S tensional discontinuity – embryonic Zázrivá fault was founded as well.

In the third period (NE-SW compression, NW-SE tension respectively, Middle/Late Miocene), the Zázrivá fault was reactivated as dextral strike-slip, but with important tensional component of stress causing downthrow of the Eastern block.

This scenario continued also in the period of NNW-SSE tension (Late Miocene-?), when the dextral separation along the Zázrivá fault was enhanced and the subsidence of the eastern block continued. It led to the erosion of relatively uplifted units in the western block, and preservation of these units in downthrown eastern block. It resulted in great geological differences in the western and eastern block of the Zázrivá fault.

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