

mineralization products of (1) and (2). In (3) the orogen parallel hot line is located in the South-Veporic zone, producing besides the uplifting of this zone, also the penetration of ore-bearing fluids into appropriate extensional fractures (C) in the contact zone between Veporicum and Gemericum, as well as in minor amount into Gemericum. The existence of two generations of pre-Neogene mineralization within the Western Carpathians (e.g. in Gemericum it was a dominant Variscan and minor Alpine mineralization) was a reason of misunderstanding and many decades lasting scientific disputes among geologists in Slovakia.

Neogene mineralization phase (4) is areally limited to solidified Miocene volcanic bodies (C), being either effusive (solidified lava flows) or extrusive (disseminations in volcanoclastic and pyroclastic sediments), as well as to their close vicinity (usually in the form of disseminated and stockwork mineralization). The origin of magma (A) is generally explained by the heat flow (B) related to asthenosphere upwelling due to subduction slab dipping from the north under Inner Western Carpathians.

The repeated metallogenetic phases in the Western Carpathians owe to existence of at least three orogenic (Wilson) cycles operating in the mobile zone between the Gondwana and Laurasia (Laurussia) in the territory of recent Slovakia. These metallogenetic phases have produced the mineral wealth of the country, including numerous deposits of public importance.

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Microtectonic studies of the faults

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Fault zones were studied in microscopic scale to compare microfractures and grains within a fault plane with the striations visible on the fault surface in the field. Different lithologies were chosen in different geological conditions. Within the Central Europe, we have tested samples of the sediments, crystalline, and metamorphic rocks. We have established the methodology for studying and processing the samples as follows:

1. Sampling of oriented samples in the field
2. Preparation of the polished samples
3. Photography of a complete sample using an optical microscope (Fig. 1a)
4. Detail photography net of sample and picture composition (Fig. 1b)
5. Highlighting microfractures and grains in the composite picture manually (Fig. 1c) and semi- automatically (Fig. 1d)
6. Vectorization and topology imaging (Fig. 1e)
7. Automatic and manual reading of bearing

8. Visualization of the microfractures and grains (Fig. 1f)

The preferential orientations of microfractures and grains were compared with the striations on the fault surface. Anisotropy of magnetic susceptibility (AMS) was measured on five samples in order to correlate the microstructure and grain orientation of large mostly diamagnetic minerals with the orientation of paramagnetic and ferromagnetic minerals. The results showed two different behaviours. The more common one is the longest AMS axis k_1 aligned with striation and the orientation of the grains (gneiss and phyllite). The second behaviour, which was found only within the red quartzite, shows the shortest AMS axis k_3 parallel to the lineation.

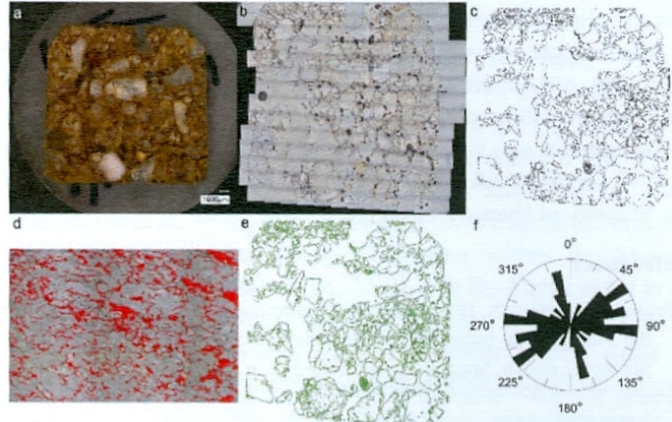


Fig. 1 Sample processing step by step.

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Significance of Jurassic early deformation structures in the SW-Bükk Mts.

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Field work in the quarry of Bükkzsérc and at the Patkó Cliffs (SW of Bükk Mts.) revealed several types of early, soft-sediment deformation structures in the Jurassic Bükkzsérc Limestone which was deposited in a subduction-related basin of the Neotethys Ocean and now appears as olistoliths in the accretionary Mónosbél Complex. These structures include small syn-sedimentary normal faults, ductile shear surfaces and slump folds, both of which were not recognized by previous structural geological and sedimentological studies (e.g. Németh 2007), although these structures have direct implications for the poorly known early deformation history of the Mónosbél Complex and possibly of the Bükk para-autochthonous unit.

The aim of our study was to estimate the Jurassic paleo-stress field for the Mónosbél Complex of the Bükk Mts. by measuring syn-sedimentary faults, and to estimate the paleoslope direction from the slump fold geometries.

In case of the normal faults, the key observations in our interpretation were that the faults are characterized by rounded, curved shapes, and that they don't have discrete fault planes. This can be explained by syn-sedimentary deformation in case of which the deformation in soft sediments is limited, while the diagenetic processes may have further effects on fault geometries as well.

Data were rotated back to its paleoposition by the average paleomagnetic data attributed for the Bükk Mts. (e.g. Márton & Márton 1996). Based on the back-rotated small-scale deformation structures we estimated a NE-SW extension as the Jurassic paleostress field, while the results of the slump fold analysis showed a SW paleoslope direction. Although these extensional directions match the previous broad estimations, we need to take into account that the olistolith itself could have had further rotation, so in order to finalize our estimations, additional measurements in other olistoliths and direct paleomagnetic data from the Bükkzsérc olistolith are still needed.

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Characteristic microstructures and deformation of the Dorozsma marble, Tisza Mega-unit, South Hungary

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The basement of the Tisza Mega-unit, Hungary, comprises three Alpine zones: the Mecsek, Villány and Békés-Codru Zones. Within the Békés-Codru Zone, the metamorphic basement block near the village of Dorozsma can be subdivided into three tectonic units: the upper unit consists mainly of mica schist and gneiss with sporadic occurrence of metapelite, while the lower unit consists dominantly of amphibole-biotite gneiss and amphibolite. Between these tectonic blocks a few-meter-thick marble unit was identified (M. Tóth 2008).

Petrographic examination of marble core samples and archive thin sections was carried out from the boreholes of Dorozsma-4, Dorozsma-7 and Dorozsma-54. The studied rocks are greyish white, fine grained marble samples showing brittle-deformation features. Under a microscope the samples are fine grained marbles with heteroblastic texture. The carbonate crystal boundaries are dominantly sutured, embayed and rarely curved. All the morphological types of deformation twins appear in the samples, but dominantly twin types I, II and IV are present. The characteristic features of the samples are small dissolution cavities filled with fine crystalline carbonate, blocky quartz and, in some cases, with saddle dolomite. In the samples from the borehole Dorozsma-4 small inclusion free carbonate grains substitute the deformation twins of the large carbonate crystals. In addition, small carbonate grains and

Mg-chlorite flakes can be found among the large carbonate crystals. Based on the observed microtextural features the fine grained carbonatic edge could be the result of a low temperature dynamic recrystallization (Liu et al. 2002). Characteristic microstructures of the samples from well Dorozsma-7 are large sigmoid carbonate clasts in very fine grained, micritic matrix. The deformation twins of the carbonate clasts can be easily identified but show the signs of recrystallization. These samples beside the carbonate clasts also contain irregular shaped polycrystalline quartz grains with dissolved edges, undulose extinction and signs of dynamic recrystallization. The microstructures presented above provide an evidence for ductile deformation with a shearing component. The undirected fabric of the micritic matrix and the sigmoid carbonate clasts suggest that the main mechanism of the deformation was probably the grain boundary sliding during hydrolytic weakening (Passchier & Trouw 2005).

Consequently, the aforementioned microstructures of the studied marble samples from the boreholes Dorozsma-4 and Dorozsma-7 could be the results of hydrolytic weakening effect of hydrothermal fluids during deformation (Liu et al. 2002).

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Pre-Variscan rift-related structure and metamorphism in the Domažlice Crystalline Complex, (the Teplá-Barrandian Domain, Bohemian Massif)

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The best preserved record of the pre-Variscan regional metamorphism in the Teplá-Barrandian Domain is traditionally ascribed to the Domažlice Crystalline Complex. In order to better constrain the nature and timing of this event, we have investigated metasedimentary rocks by structural analysis, in-situ U-Pb LASS ICP-MS monazite and xenotime dating and P-T modelling. The rocks were sampled across the biotite, garnet, staurolite-andalusite and sillimanite zones.

The structural analysis revealed dominantly gently ESE inclined fabric S1 which is modified by open large-scale folds with moderately to steeply NW-dipping axial planes S2. Textural relationships suggest that garnet1-, andalusite-, staurolite- and sillimanite-bearing mineral assemblages are post-dating the S1 fabric and pre-dating D2. The mineral growth related to the D2 event is almost missing. It represents rare younger garnet2 generation or