Geol. Paläont. Mitt. Innsbruck, ISSN 0378–6870, Band 25, S. 1–242, 2001

DEVELOPMENT OF DEFORMATIONAL STRUCTURES DURING ALPINE METAMORPHISM OF THE MESOZOIC COVER ROCKS IN THE VEPORIC UNIT, WESTERN CARPATHIANS

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The Veporic superunit is the middle of three thick-skinned basement thrust sheets of the Central Western Carpathians. The imbricated crustal structure originated during the Cretaceous continental collision after the Late Jurassic closure of the Meliata ocean. As a consequence of collisional thickening, the Veporic basement and its Permian-Mesozoic cover suffered regional Alpine metamorphism (JANÁK et al., 2001).

Triassic metaquartzites, metacarbonates and metapelites are the main lithological varieties of studied metasedimentary Mesozoic cover rocks. Phyllosilicate crystallinity data (illite-muscovite and chlorite basal reflections) and chemical composition of metamorphic newly formed minerals suggest the upper anchizonal and epizonal (greenschist facies) metamorphic overprint (LUPTÁK et al., 1999). Alpine metamorphism caused recrystallization of former clay minerals and the growth of new authigenic white mica, chlorite, albite and potassium feldspar.

This study presents the main deformational macro-, meso- and microstructures, representing the oldest ductile structural elements developed during Alpine D1 deformation stage in metacarbonates and metaquartzites of the Mesozoic cover.

The D1 structures represent a large-scale subhorizontal ductile shear zone. This shear zone is interpreted as a low-angle detachment fault zone that parallels the basement/cover interface and lithological boundaries within the Veporic cover (PLASIENKA, 1993; PLASIENKA et al., 1999; HÓK et al., 1993). This detachment fault was active during the Late Cretaceous exhumation of the Veporic metamorphic core complex. Orogen-parallel extension was accompanied and followed by orogen-normal contraction producing superimposed deformation stages (PLASIENKA, 1993).

For studied rocks a penetrative, flat-laying subhorizontal or moderately NE to SE-dipping metamorphic/mylonitic foliation S1 is characteristic, which is mostly parallel to the original sedimentary bedding. S1 originated mainly by intensive flattening where the pressure solution and dynamic recrystallization took part. The foliation planes bear a distinct stretching and/or mineral lineation L1 trending generally W-E. In many cases, studied rocks exhibit moderately E to NE-dipping shear bands which are mesoscopically penetrative.

Entirely recrystallized quartzite shows strong preferred orientation of mica foliae. Original detrital quartz grains are flattened and stretched and show undulose extinction in the most deformed rocks. Quartz recrystallized grain size in mica-poor layers is larger than in mica-rich layers because in the latter the grain growth was limited by mica grains pinning at the quartz grain boundaries. Some quartz porphyroclasts show shape preferred orientation due to dissolution along boundaries parallel to the foliation. The extent of the pressure solution has been enhanced in some cases by the presence of deformation resistant magnetite grains. Both the face and displacement controlled pyrite-type quartz fibres formed in the pressure shadows.

Marbles exhibit various grain sizes and microstructures. Foliation planes are defined by elongated coarse-grained relic calcite porphyroclasts and dynamically recrystallized fine-grained calcite matrix, both showing the shape preferred orientation. For the first set of grains the clockwise and anticlockwise twins are dominant which become subparallel with respect to the foliation with increasing strain intensity. Dolomite porphyroclasts behave as rigid bodies and are concentrated with other insoluble material on the zig-zag stylolitic boundaries. The authigenic white mica and chlorite concentrate in thin layers together with quartz but are also widespread as single flakes in the marble oriented subparallel to the main foliation plane.

The Veporic cover rocks are overlain by various rock complexes of several large-scale nappe units (better extensional allochthons in the present state). Carboniferous low-grade metasediments of the Gemeric superunit display the same structural association as the Veporic cover, though the strain intensity is weaker. Overlying Murán nappe is built dominantly of the Triassic carbonate platform complexes, which are not affected by ductile deformation. However, slices of very low-grade metamorphosed sediments occur in places between the Veporic cover and the Murán nappe, which might belong to the Meliatic and Turnaic cover nappe systems (VOJTKO, 2000).

The variable microstructures and step-wise, but rapid upward decreasing strain intensity and metamorphic grade within the extensional low-angle detachment fault indicate significant vertical thinning and telescoping of metamorphic isograds. The fault nucleated along the rheologically weak horizons of quartzites and marbles of the Veporic cover during the initial phases of exhumation. Later on, its activity was controlled by changing deformation mechanisms (hardening and softening) due to decreasing P-T conditions in rock units of different composition. The principal displacement plane relocated several times, finally producing lens-shaped extensional allochthons bounded by low-grade ductile/brittle, or basically brittle shear zones.

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