Significance and Consequences of Cretaceous Convergent Tectonics in the Vepor Unit, West Carpathians

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The Vepor unit composed of the pre-Alpine basement and Late Palaeozoic – Mesozoic cover sequences is one of the major crustal segments incorporated into the Alpine structure of the Central West Carpathians. The basement consolidated during Variscan tectono-metamorphic event consists of high-grade orthogneisses, migmatites and large calc-alkaline intrusive bodies overlying meta-sedimentary rocks, mainly micaschists, paragneisses and amphibolites. The basement rocks together with the sedimentary cover rocks were largely modified during Cretaceous time when several deformation events occurred.

Our field studies revealed existence of four different structural domains throughout the Vepor unit. In northern, southern and eastern domain, we distinguished dominant generally SE dipping cleavage defined by axial planes of isoclinal folds. The cleavage changes its dip from moderate in the North and the South to sub-horizontal in the East. On the contrary central domain of the Vepor unit is characterized by the presence of subhorizontal mylonitic fabric connected with development of vast mid-crustal shear zone. The mylonitic fabric bears E-W trending stretching lineation which in general dips to the east. The Vepor unit was subsequently affected by oblique convergence with southern Gemer unit (Lexa et al., 2003) responsible for kinking and folding of earlier fabrics in the weaker lithologies preferentially.

In the central domain, our microscale observations of heterogeneously deformed orthogneiss of the shear zone revealed existence of two metamorphic-microstructural zones: the lower grade LT zone in the east and the higher grade HT zone in the west. The microstructure of the LT zone is characterised by the presence of mantle-core microstructure of quartz and quartz fill of K-feldspar fractures whereas quartz porfyroclasts in the HT zone are completely recrystallized and the K-feldspar fractures are filled with mixture of quartz and albite grains. Electron back scatter difraction (EBSD) measurements of quartz crystal preferred orientation (CPO) confirmed operation of dislocation creep using basal, rhomb and prism slip systems. Subgrain rotation recrystallization mechanism is suggested to operate in quartz in both zones with continuous increase of recrystallized grain sizes from 0.062 mm to 0.119 mm towards the west. P-T conditions in both zones were modelled using THERMOCALC (Powell et al., 1998). By plotting the garnet isoplates we obtain 430–460 °C, 0.5–0.7 MPa for the LT zone and 450–480 °C, 0.6–0.8 MPa for the HT zone. The garnets show continuous decrease of manganese content from core to rim which in context of construction of pseudosection corresponds to prograde P-T path and increase of pressure-temperature up to 0.2 MPa and 25 °C.

We consider observed macro-structural pattern in northern, southern and eastern domain together with prograde P-T path obtained in the central domain being consistent with overall convergence of the region leading to the thickening of the Veporic crust. We propose that the dislocation creep dominated localized stretching of the central part of the Vepor unit during Cretaceous orogeny documents orogen parallel extension event triggered by reduction in strength of the thickened quartzo-feldspathic crust in combination with only limited mechanical influence of the lithospheric mantle (Rey et al., 2001).

References

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Polydeformational-Polymetamorphic Evolution of the Vepor Unit, West Carpathians: Petrological and Microstructural Study

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The Vepor unit composed of pre-Alpine basement and Late Palaeozoic to Mesozoic cover sequences is one of the major crustal segments incorporated into the Alpine structure of the Central West Carpathians. The basement consolidated during Variscan time was together with its sedimentary cover sequences largely modified during Alpine (Cretaceous) tectono-metamorphic event. Because of strong Alpine overprint it was difficult to distinguish structures and mineral assemblages formed during Pre-Alpine tectono-metamorphic processes. Based on detailed field analysis in combination with microstructural and petrological investigation performed mainly on relict garnet and quartz, we were able to recognize deformation effects and estimate PT conditions of Variscan metamorphic event.

Two varieties of basement rocks were selected for this study; the orthogneiss of the Klenovský Vepor and paragneiss of the Trstie Massif. These rocks are located in the central part