3D-Tectonics of the Devonian Rocks near the Adamov Town (the Brno Massif)

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The locality under study is situated about 1 km NE of Adamov in the first meander of the Křtinský Brook. There are Devonian basal clastics (red-brown and yellowish arkose) and limestones (medium grey, micritic) set within granodiorites of the Brno Massif, which are not conjoined with the main mass of Devonian rocks of the Moravian Karst. The rocks under study are intensive strained under ductile or brittle-ductile conditions. The foliation dip strike and inclination vary between 316/88 in the south and 222/37 in the north. The strike of the flexion axis (cylindricity axis) is 220/38. It corresponds to the average lineation strike 215/29. The lineation trends NE-SW with the dip between 15 and 40° to the SW (Rez, 2001).

Devonian rocks form small tectonic slices incorporated into the granodiorites during old thrusting (D1). Later, during younger thrusting (D2), this slice was flexed ("drag fold") and cut by dextral thrust fault. There is good evidence of D1 and D2 separation except large-scale geometry, because all old small-scale structures were destroyed by D2. Dextral strike-slip movement with small thrust component to the NE was determinated according to asymmetric structures. Based on these evidences we can associate this movement (D2) with the movements along the Moravian shear zone.

The occurrence near Adamov can be considered a large part of an overturned fold limb. The most north-eastern outcrop of the basal clastics with the smallest inclination may be very close to the hypothetical younger thrust plane. The limestones occur only in the part showing the steepest dip. This very interesting fact can be explained by subsequent complete pressure solution of horizontal parts and preservation of the vertical one (compare the occurrence of Devonian limestones near Valchov; Melichar et al., 1999).

The flexion axis is inclined to the SW, which is atypical of the Bohemian Massif. It was probably inclined by post – Cretaceous rotation. This rotation is well – documented in the area between Valchov and Vratíkov (about 8 km north of this locality): it is younger than Cretaceous sediments, which were rotated together with the basement, and older than Badenian sediments near Boskovice (Melichar and Kalvoda, 1997). This anomalous inclination is suddenly terminated at the southern marginal fault of the Valchov trough (halfgraben), so we can deduce their contemporaneous origin. Formation of the anomalous orientation near Adamov can be associated with the Blansko trough, tool.

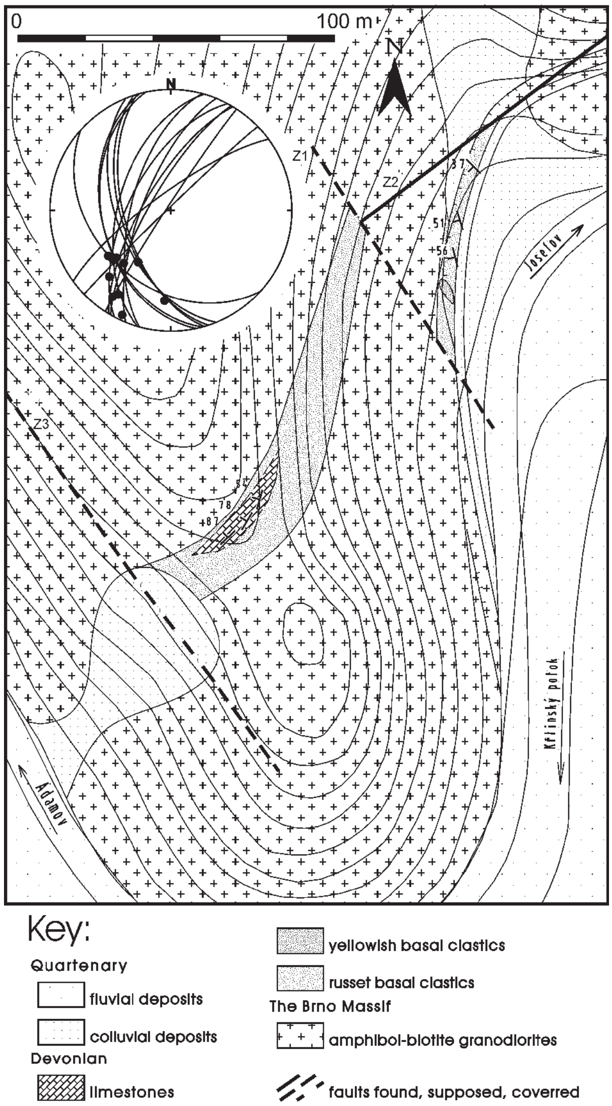

Fig. 1. Geological map of the locality under study (Adamov); equal-area area projection of stretching lineations (points) and foliations (circles) is in the upper-left corner.

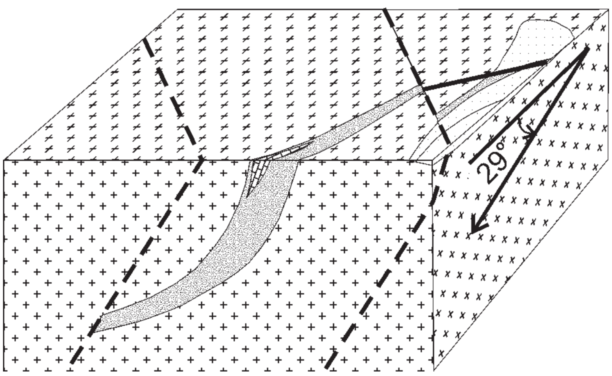

Fig. 2. 3D-model of the structure, the average strike of lineation is marked by arrow.

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The Determination of the PT Conditions during Transition from Steep Syn-Extrusional Fabrics to Horizontal: NE Snieznik Domain

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Steep to subvertical fabric overprinted by later shallowly dipping to subhorizontal foliation system is systematically preserved within the orthogneisses, HP granulites as well as within the volcanosedimentary Stronie series of the Orlica-Snieznik dome. These structures are interpreted as a result of a vertical extrusion of the lower crustal rocks and subsequent horizontal flow over mid-crustal units. The aim of this work is to correlate the PT evolution with this structural succession and particularly to determine the depth and the temperature conditions of this major structural fabric transition. For such a study we used the metapelite lithologies of the Stronie series. Besides the possibility of the calculation of the PT conditions using standard thermobarometry, the suitable assemblages of metapelites allow the modelling of mineral equilibria in the simplified chemical system with the software THERMOCALC. In addition, the relationships of the mineral inclusion trails within the porphyroblasts and the matrix foliation allow the correlation with the macroscopically observed polyphased structural evolution as well as with the metamorphic PT path.

The first observed foliation within the volcanosedimetary series is a steep NE-SW trending foliation, developed under amphibolite facies conditions. It is strongly folded by open to isoclinal folds with NE-SW trending axes and axial planes dipping under shallow angels either to NE or to the SW. The early crystallization of the garnet and albite porphyroblasts, followed by the growth of the staurolite and kyanite was connected with the development of the steep fabric. During development of subsequent flat crenulation cleavage and transposition into a new flat foliation these minerals were rigid and passively rotated into the new fabric. This observation is supported by detailed measurements of oriented quartz inclusion trails within the garnet porphyroblasts from the fold limbs and fold hinges. Within the fold hinges the garnets are not reoriented and still reveal the original steep inclusion trails, while the matrix foliation is strongly crenulated and flat. Within the fold limbs garnets rotated together with the foliation, and consequently the inclusion trails, which originated during S1 tend to be subparallel with the flat foliation S2. The development of the new fabric is contemporaneous with the growth of the sillimanite and the recrystallization of the plagioclase porphyroblasts into oligoclase aggregates. Later andalusite postkinematically overgrowths both steep and flat fabrics at the end of the metamorphic and structural evolution.

The garnet-biotite thermobarometry and garnet-plagioclase-Al_2SiO_5-quartz barometry calculated for two samples using the rim compositions of the minerals yield temperature around 580–620 °C and pressure varying between 8 and 11 kbar. The calculated PT conditions can be interpreted as the peak attained conditions. However, using this method we are not able to distinguish the difference between the kyanite and sillimanite grade. In addition this method does not provide any information about the PT evolution of the samples, and consequently does not allow the correlation of the PT evolution with the observed structural succession. To obtain better information about the PT evolution we have constructed the KFMASH pseudosections using the software THERMOCALC. These diagrams, calculated for a specific bulk rock composition, show directly the mineral assemblages that would crystallize in the studied rock under different PT conditions. The major advantage of pseudosections is that calculated isopleths of mineral composition compared with the observed zoning of the minerals now provide quantitative information on the PT evolution. The PT paths obtained for mineral compositions and zoning of the porphyroblasts of the garnet and staurolite from two pseudosections in the KFMASH system are correlated with the succession of the mineral growth deduced from microstructural analysis of inclusion trails and mineral textures.

Provenance and Diagenesis of the Upper Cretaceous and Palaeocene Sandstones of the Magura Nappe: Constraints from Cathodoluminescence Study.

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Cathodoluminescence is fairly used in sedimentary petrology to identify source of clastic material, diagenetic processes (Götze et al., 1999; Sikorska, 2000) and many others, though it was successfully used for such purpose for the investigated samples. The studied samples represent the Szczawina sandstones, the Ropianka beds, the Jaworzynka sandstones and sediments belonging to the Jarmuta and Szczawnica formations of the Magura nappe.