3D Tectonics of the Prague Synform (Barrandian, Central Bohemia): New Preliminary Results

Rostislav MELICHAR[1]

[1] *Department of Geological Science, Masaryk University, Kotlářská 2, 611 37 Brno, Czech Republic*

Alpine-style deformation in the central Bohemia has been known since 1907, but the exact 3D structural investigation was not possible without precise stratigraphy and facial analysis. Progress in these fields of geology as well as in tectonics enabled resurrection of the Barrandian nappe structures in nineties (Melichar and Hladil, 1999). Three main reasons for nappe structures support this idea:

1. Duplication of the stratigraphic sequences along thrusts
2. Top-to-the-south/southeast movement on detachment thrusts
3. Tectonic juxtaposition of different facies.

New systematic tectonic researches supported by grants of FRVŠ (599/03) and AVČR (A3013406) enable to formulate main principles of the 3D tectonics of the area:

1. Longitudinal stratigraphic separation diagrams for studied thrusts are good tools for thrust geometrical researches. Stratigraphic separation diagram (SSD) plots the vertical stratigraphic position of fault hanging wall and footwall against distance in along-strike direction. Interpreting SSDs we can locate hanging wall and footwall flats and ramps and prove flat-and-ramp fault geometry. SSDs for Tachlovice and Očkov thrusts are plotted in the Fig. 1. The main flats are situated in the Bohdalec and the Králův Dvůr formations in the northeast and in the Králův Dvůr and the Liteň formations in the southwest. Ramps are situated in the Kosov Formation and in the Upper Silurian and Lower Devonian rocks.
2. While these SSDs indicate flat-and-ramp fault geometry and position of these ramps, it is not possible to solve what type of ramp is it (e.g., frontal, lateral and oblique). Two lateral/oblique ramps in footwall were found in the southwestern part of the area under study. Actual changes in orientation of the thrusts as well as zones of steep termination of the large fault-related folds (folds plunging at steep angles) are main arguments for the location of these structures.
3. Large south-vergent linear folds are related to main thrusts (e.g., Koda and Očkov thrusts) and indicate frontal ramps of these thrusts. The frontal (southern) parts of these folds are marked by zones of intensive disharmonic folding with inverse vergency (e.g., Barrande Rock, rock near the mouth of the Kačák river, etc.).

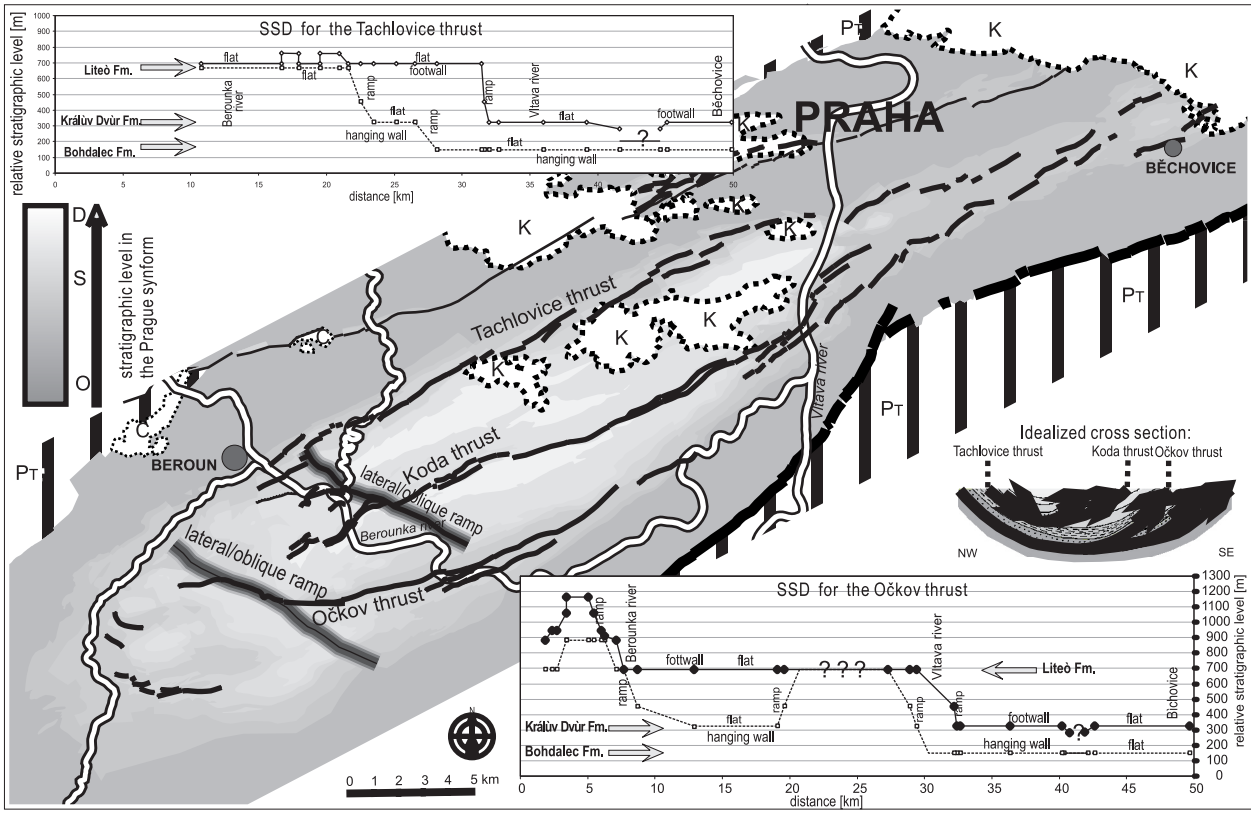

Fig. 1. Structural outline map of the Prague synform (Central Bohemia) showing location and SSDs of main thrusts and location of footwall transverse zones (lateral/oblique ramps). Abbreviation: SSD - stratigraphic separation diagram, PT - Upper Proterozoic, O - Ordovician, S - Silurian, D - Lower to Middle Devonian, C - Upper Carboniferous, K - Upper Cretaceous.

4. Variscan tectonic evolution of the area was in two important phases: (a) SSE-NNW compression with folding and thrusting in the uppermost Middle to Upper Devonian and (b) Lower Carboniferous phase producing a large-scale structure of the Prague synform.

References

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P-T-d Record of Rocks of the Stronie Formation (Orlica-Śnieżnik Dome, Sudetes): Evidence of a Continental Collision

Mentor MURTEZI[1] and Mirosław JASTRZĘBSKI[1]

[1] *Institute of Geological Sciences of the Polish Academy of Sciences, Podwale 75, 50-449 Wrocław, Poland*

Comparison of metamorphic conditions and tectonic features recorded in different rocks forming the Orlica-Śnieżnik Dome (OSD) shows that it is impossible to construct a common P-T-d path, into which all the so-far obtained data could be fitted. Thorough analyses of structures and P-T record coming from different rock varieties of the Stronie formation univocally testify to the lack of a high pressure episode in its metamorphic history. Maximum depth of burial ascertained for rocks of the Stronie formation does not exceed 30 km, which stays in a huge contrast to more than 100 km of burial, established for the OSD eclogites (Bakun-Czubarow, 1998). Moreover, similar gap in pressure has been ascertained between the eclogites and their host gneisses.

However a geotectonic setting and mechanism controlling the early stage of the tectono-metamorphic evolution of the OSD is difficult to reveal, the P-T trajectories obtained for rocks of the Stronie formation, with prograde P-T evolution dominated by the increase of temperature with a moderate increase of pressure together with moderate P-T ratio, favour continental collision as a geotectonic process controlling the early stage of its metamorphism. Shortening connected with this collision led to the subduction of the Stronie formation causing the metamorphism of rocks under the amphibolite facies conditions. Structural relicts of this shortening, occurring in form of rare intrafolial folds and traces of steep foliation planes preserved as a inclusion trails in porphyroblasts, indicates that shortening took place along the general E-W direction. Subsequent uplift was accompanied with a development of a bi-vergent tight to isoclinal folds, resulting form subvertical shortening and flattening. Under this circumstances primary isograd pattern was developed, indicating decrease of the peak-metamorphic conditions towards the west. As a result of continuous convergence and due to the lack of space, movements along the colliding crustal units took place. This latter event is treated as a cause for disturbance of the isograd and isotherm pattern observed within rocks of the Stronie formation. It is also responsible for zonal shearing, taking place generally along the N-S direction, as well for dissected rise of a high P rocks.

Style and Mechanisms of the Early Phase Deformation in the Eastern Part of the Bükk Mts. (NE Hungary)

Norbert NÉMETH[1] and Ferenc MÁDAI[1]

[1] *University of Miskolc, Dept. of Geology and Mineral Deposits, H-3515 Miskolc-Egyetemváros, Hungary*

In the Paleozoic and Mezozoic rocks of the Bükk Mountains the imprints of a polyphase deformation (eg. Balogh, 1964, Csontos, 1999) and an anchi-epizonal metamorphism (eg. Árkai, 1973, Dunkl et al., 1994) were observed. According to former opinions confirmed by our investigations, the physical conditions of this metamorphism were the same as that of the earliest, ductile deformation phase. The imprints of later deformation phases can be distinguished in general by their tectonic style that includes brittle elements, too. However, neither ductile deformation nor metamorphism affects all rock bodies of the Bükk Mts. in the same degree.

On the eastern part of the mountains the most widely distributed, therefore the mostly comparable rock types are limestones. In these rocks, the texture elements that developed during the early phase deformation are preserved and dominant in most cases. Sedimentary texture elements are recognizable only in certain units. Our investigation was focused on the style of folding and on the different textural elements of limestones which developed during the early deformation phase. Observations were made on some hundreds of outcrops and on samples taken from a part of these.

According to the lithologic conditions and the geographical position, the folds show a certain style variety but most recognizable folds are class 2 multilayer folds (fold classification after Ramsay, 1967) and have a divergent fan cleavage. In many areas, in successions comprising of limestone, shale and/or chert layers, the more competent strata (chert vs. limestone and limestone vs. shale) show small-scale folding in hinge zones and boudinage on limbs of the large-scale folds. The fold geometry corresponds to the flexural shear model with pure shear in