

A Ramp-and-flat Geometry of Thrust Faults in the Pavlov Hills, Western Carpathians, Czech Republic

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The Pavlov Hills are situated in the westernmost part of the West Carpathians at their contact with the Eastern Alps. The Jurassic to Cretaceous pre-flysh sediments form slices incorporated in the Paleogene flysh nappe (Ždánice unit). The Upper Jurassic part consists of dark gray deep marine claystones to limestones (Klentnice Formation), which prograde into light shallow-marine limestones (Ernstbrunn Limestone). The Cretaceous mostly siliciclastic sediments overlie these limestones. The structure of Pavlov Hills was produced by thrusting in the Carpathian accretionary wedge during the younger phase of the Alpine orogenesis (lower Miocene).

During our tectonic research in the Pavlov Hills the orientation of bedding in sedimentary rocks was studied. Two main maxima of bedding orientation were recognized. The bedding planes were buckled into several upright anticlines with fold axis very gently plunging to NE. Very well documented large brachyanticline is situated in the eastern part of Mikulov (Svatý kopeček). This structure was recognized during the new reinterpretation of seismic sections under the surface.

New geological mapping (with more detailed stratigraphic division) and compass data together with the data in old boreholes (Nové Mlýny-3) show several thrusts with stratigraphic inversions and tectonic duplications of the Jurassic formations. Thrusts are marked by high-strain zones with large amount of small tectonic slices of different age (Jurassic, Cretaceous, Paleogene).

The anticline structure is accompanied by duplexes. Thrusts are usually subparallel to bedding and mostly striking in NE–SW direction and dipping to the SE. Detachments are distinguished in the Klentnice Formation, in the “nodular limestones” (middle Tithonian) and at the top of the Ernstbrunn Limestone. Some more steep parts situated in the Ernstbrunn Limestone are interpreted as ramps. The angle Φ between the flats and the ramps is 20°. This value was obtained by the weighted average of friction angles of the failure-tested Jurassic rock using Mohr-Coulomb failure model.

The anticlines were formed in a ramp-and-flat geometry regime, so the balanced cross-section could be constructed based on seismic data across the Pavlov Hills.