

Subsidence and thermal history of the Variscan orogen and foreland in the Upper Silesian Basin – a model calibrated by vitrinite reflectance

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The Palaeozoic in the eastern part of the Bohemian Massif belongs to the Rhenohercynian Zone of the Variscan orogenic belt. The foreland is built of the crystalline rocks of the Brunovistulian unit of Baltica covered by Devonian to Lower Carboniferous carbonates. The Variscan flysch (Culm) was deposited during the Viséan and its present thickness decreases from the West to the East. The Upper Silesian Basin is considered the Variscan foredeep. It is covered by the Miocene Foredeep and partly also by the nappes of the Carpathian–Alpine orogen with opposite vergency.

The sedimentary fill of the Upper Silesian Basin consists of molasse-type siliciclastic sediments with numerous coal beds of Namurian A to Westphalian age. The vitrinite reflectance (R_r) in the Upper Silesian Basin increases with depth from 0.8 to 2.2 % in the Namurian A and up to 5 % in the Devonian to Viséan. Regionally, the coal rank at the Carboniferous surface increases from the East to the West. Mathematical modelling is

applied to simulate the burial and thermal history and to calculate the diagenesis with depth in selected parts of the basin. The vitrinite reflectance in deep borehole profiles serves as calibration data in the models.

The modelling results suggest less regional variations in palaeo-heat flow in the Upper Silesian Basin than estimated by the earlier authors while significant differences are observed in the amount of the eroded upper part of Palaeozoic section. The maximum calculated burial occurs in the Variscan flysch in the thrust and fold belt in the W. The thickness of the eroded units decreases toward the foreland in the East. Surprisingly, the least thermally mature Palaeozoic rocks are at present deeply buried below the West Carpathian orogenic wedge. This suggests that the Alpine overthrusting did not expose the Palaeozoic units to higher temperatures than those experienced during the final phases of the Variscan orogeny.

Two-dimensional model of subsidence and thermal maturation in the West Carpathian fold and thrust belt and foreland, Czech Republic

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The progradation of the Alpine-Carpathian orogeny caused tectonic mobilization of the foreland associated with subsidence and deposition of Late Cretaceous to Miocene sediments on the southern margin of the North European platform. The facial distribution was controlled by the lithosphere flexure, tectonic activity, topography and global sea-level oscillations. The depocentres migrated towards the foreland and the basin fill was gradually detached from the substratum, stacked and thrust over the foreland. In the Early Miocene, the late orogenic and postorogenic

foredeep basin formed.

The evolution of sedimentary basins situated on the eastern margin of the Bohemian Massif is simulated using a two-dimensional modelling programme of subsidence, burial and thermal history. Analysis of diagenetic patterns provides a quantitative evaluation of the sedimentary and tectonic burial, uplift and erosion. The autochthonous sedimentary cover of the Platform shows increasing thermal maturity with depth, i.e., with increasing age. Several erosional events removed a considerable amount of sedi-