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Post-Sedimentary Mesozoic – Cenozoic Thermotectonic Evolution of the Krkonoše Piedmont Basin (Bohemian Massif) Interpreted from Apatite Fission-Track Analysis

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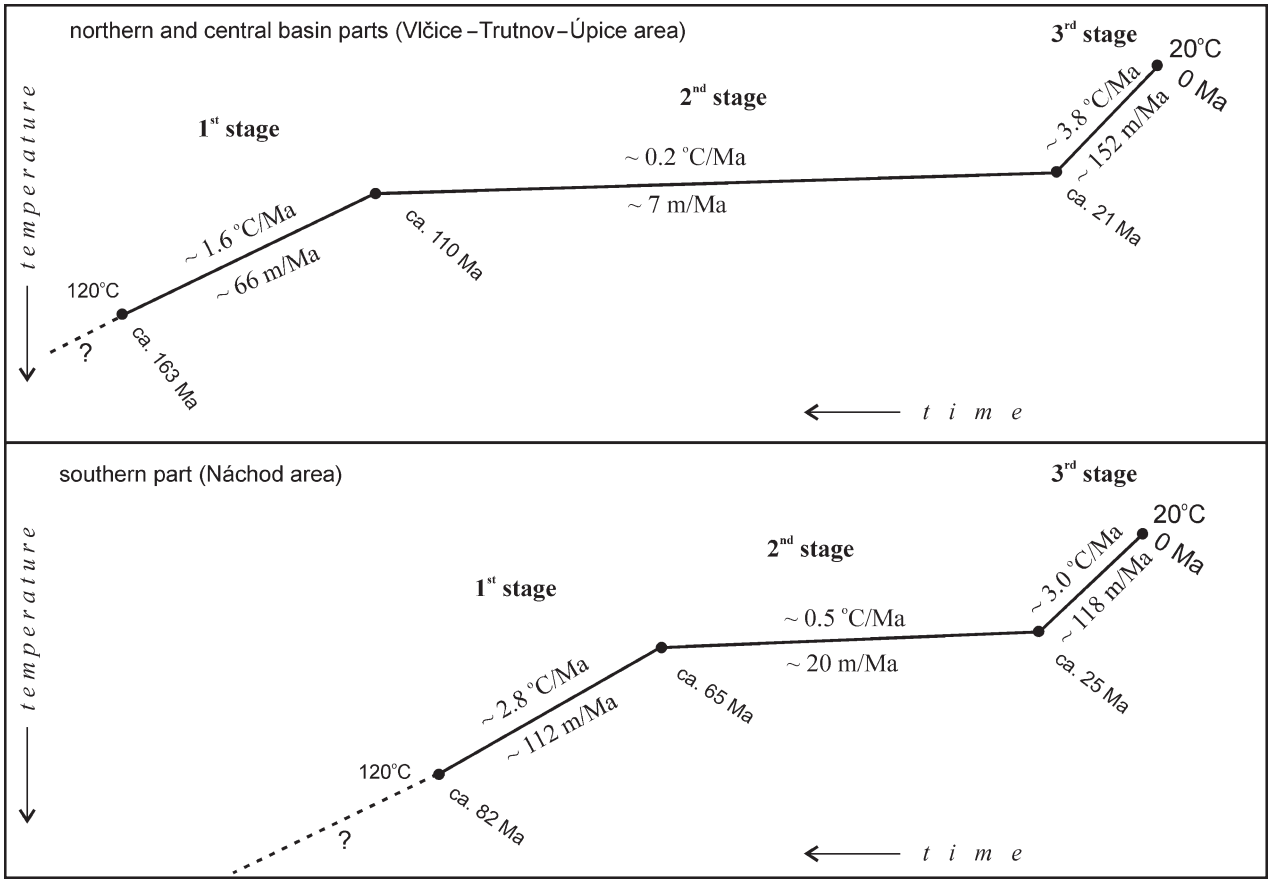
We have studied the low-temperature history of the sediments in the Krkonoše Piedmont Basin (KPB) using fission-track (FT) dating of detrital apatites. The Krkonoše Piedmont Basin belongs to a system of post-orogenic extensional / transtensional basins which main part formed in the Bohemian Massif in the early post-orogenic phase, between the Westphalian and Saxonian times (c. 310 – 280 Ma). Most of the basins in Western and Central Bohemia are aligned along the NE-striking boundary of the Saxothuringian Zone of the Variscan orogeny, with minor modifications of the structural picture caused by NW-oriented fault zones and small basins formed at a later stage (Stephanian) along NNE-oriented faults such as the Rödl / Blanice Fault Zones. The older parts of the KPB fill (Westphalian-Autunian) underwent partial deformation during the formation of the Trutnov-Náchod sub-basin (Saxonian-Triassic), which is indicated by the angular unconformity at the base of the Trutnov Formation, the lowermost unit of the sub-basin infill. Deformation was governed mainly by dextral strike-slip along the northwest oriented faults parallel with Lusatian and Hronov-Poříčí fault zones. Further reactivations of the same fault systems in similar kinematic regime occurred during the mid-Cretaceous opening of the Bohemian Cretaceous Basin. The last phase of major deformation is attributed to the Palaeogene when several phases of NNE-NNW-oriented compression caused thrusting at the Lužice and Hronov-Poříčí Fault Zones and some adjacent structures. No firm evidence is found in the KPB of significant involvement of the later phases of deformation, recorded in the northern part of the Bohemian Massif: the opening of the Ohře Rift during the late Oligocene-early Miocene, and subsequent deformation phases of the Late Cenozoic. This kinematic hypothesis presented by Uličný et al. (2002) consider for the timing of major events mainly intervals, where stratigraphic or structural record exists. The apatite fission track data reveal low-temperature information about complicated post-sedimentary history of the KPB, especially from periods lacking stratigraphic record.

Five studied samples dated by fission-track technique come from outcrops from alluvial-fluvial Trutnov Formation. Outcrops of the Trutnov Fm. are dominated by brown-red conglomerates, sandstones with minor siltstone and mudstone interbeds and carbonate-cemented intervals. The apatite fission track lengths in all studied samples are very homogeneous and range from 12.1 ± 1.9 to 13.1 ± 1.5 micrometers (1 σ). All horizontal confined track distributions are unimodal with a negative skewness, interpreted as resulting from a slow cooling through the apatite partial annealing zone (PAZ, 60–120 °C). The measured FT apatite average cooling ages range from the Early Cretaceous to Cretaceous / Palaeogene and varies from 60 ± 5 Ma to 114 ± 11 (1 σ), corresponding to an average cooling rate 0,5 to 1,1 °C/Ma from the Early Cretaceous to the present, while average erosion rate of the exposed rocks varies between 24 to 54 m/Ma. These results indicate pre-Cretaceous burial of Permian rocks below 120 °C, which is interpreted, assuming present-day thermal gradient of 25 °C/km, burial deeper than 4 km.

The confined track length distribution together with the fission track age of four samples was taken to model the individual thermal history of sub-basins (Figure 1). Time-temperature modelling by AFTSolve program (Ketcham et al. 2000) reveal two areas with different T-t histories in Trutnov-Náchod subbasin. Different timing of three main stages and differences in erosional rates are interpreted as earlier major uplift (1st stage) in northern part of the sub-basin (Jurassic – Early Cretaceous) comparing to southern part, where major phase of uplift took place in Late Cretaceous. Last phase of rapid uplift (3rd stage) is similar in both areas (northern and southern), and is dated to c. 25 Ma – present, which corresponds to Miocene deformation phases in the Ohře Rift.



■ **Fig. 1.** Sketch diagram of thermal modelling with AFTSolve program (Ketcham et al. 2000) illustrating differencies in timing of cooling and erosional events in northern and southern areas of the Trutnov-Náchod sub-basin. Erosional rates were calculated using thermal gradient of 25 °C/km. Horizontal and vertical axes are approximately in scale.

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Post-Badenian Horizontal Movements in the Pannonian Basin as Indicated by Paleomagnetic Data

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Although the Pannonian Basin is mostly covered by Quaternary sediments, Miocene and Pliocene rocks are accessible for paleomagnetic sampling at several points, mainly at the margins of sub-basins and around inselbergs. Owing to financial support by T034364 OTKA (Hungarian Scientific Research Found) and several bilateral projects (exchange program between Hungarian Academy of Sciences and those of Poland, Slovakia, Croatia, Serbia and Hungarian-Slovenian Intergovernmental Scientific and Technological Cooperation Project) a large number of data are available today, which are relevant to the post-Badenian