



## **Paleoseismology of the Hluboká Fault in the near-region of the NPP Temelin**

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Temelin is located in the Bohemian Massif, a Variscan basement unit characterized by very low historical/instrumental seismicity. Previous seismic hazard assessments for the site revealed very low hazard ( $PGA < 0.1g$ ) for a non-exceedance probability of 10<sup>-4</sup> per year. The assessments are based on historical/instrumental earthquake data of the Bohemian Massif that cover the time period since about 1800 and 1903, respectively.

In this study we assess the late Variscan Hluboká fault in the vicinity of the site, which was repeatedly reactivated in Mesozoic, Miocene and Pliocene times. The fault is part of the several tens of kilometres long NW-striking Jáchymov (Joachimsthal) Fault zone. It is located about 10 to 20 km south of the NPP. Geological, geophysical, and structural data characterize the fault as a dextral strike-slip fault system. Reflection seismic shows an up to a few hundred meters wide zone with steeply dipping faults that are supposed to merge into a common master fault at depth. The fault is characterized by fault bends defining a restraining and a releasing segment. The latter coincides with a pronounced morphological scarp. Recent uplift of the footwall of the fault at this releasing bend is indicated by previously published geodetic data (P. Vyskočil, 1973) and geomorphological data comparing the tectonic morphology of the fault scarp near Hluboká nad Vltavou with slopes, which are not fault controlled. All analysed geomorphological indices characterize the Hluboká scarp as a unique morphological feature, which results from Quaternary uplift of the footwall of the Hluboká Fault with respect to its hanging wall.

The assessment of the youngest tectonic history of the fault further uses correlations of Quaternary terraces of the Vltava River across the fault. We established a new Late Pleistocene stratigraphy of fluvial terraces using field and borehole data combined with OSL/IRSL age dating. The results show terrace staircases in the hanging wall and the footwall of the Hluboká Fault, which are partly not continuous across the fault and suggest Pleistocene vertical fault displacement. Terrace staircases in the hanging wall and footwall differ by the vertical distance of the undated higher terrace levels (HW3/FW3 and higher) above the Vltava River. The stratigraphic content of the lowermost terrace in the hanging wall of the fault (HW1) contains gravels with ages between  $84.5 \pm 9.0$  and  $7.9 \pm 0.8$  ka which are covered by the recent floodplain of the river. In the footwall of the Hluboká Fault coeval sediments (dated to  $\sim 50$  and 20 ka) occur at elevations several meters above the recent floodplain. These sediments appear vertically displaced for about 4.5 to 6.4 m. The current data therefore justify the assumption of significant vertical movements at the Hluboká Fault in the Late Pleistocene and/or Holocene at rates of about 0.1-0.2 mm/a.

We conclude that three different and independent lines of evidence, geodetic data, tectonic geomorphology, and displaced late Pleistocene sediments, characterize the Hluboká Fault as an active fault near Temelin. Due to the fact that no historical seismicity has been associated with the fault it is not accounted for in previous hazard assessments. The contribution of the fault to site-specific hazard of the NPP is therefore unknown.