

Pleistocene terraces of the Vltava River (Southern Bohemian Massif): Assessment of the vertical displacement of the Hluboká Fault

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Pleistocene terrace sequences of the Vltava River are used as markers to assess the activity, quantify the vertical displacement and calculate the vertical displacement velocity of the Hluboká Fault, a very slow intra-continental dextral strike-slip fault in the variscan Bohemian Massif. The study focusses on the fluvial terraces along the upper course of the Vltava River in the region of the České Budějovice Basin where the river crosses the Hluboká Fault. The fault delimits the subsided basin from the uplifting crystalline basement. Using a combination of spatial data analysis, geomorphological mapping, analysis of drilling profiles and luminescence dating, five terrace levels with bases ranging from 5 meters below to 45 meters above present river level are mapped. Although the correlation of the higher terraces with bases above the recent floodplain is impeded by the smoothing of the original topography by periglacial processes, which mostly destroyed the flat terrace surfaces, mapping of the elevation of the bases of these terraces identifies a mismatch of the relative elevations of the terraces on both sides of the Hluboká Fault. Dating of the higher terraces was not possible, because their ages are beyond the range of the luminescence method.

Fluvial sediments from the lowermost terrace level, morphologically corresponding to the recent floodplain, revealed luminescence ages ranging from about 60 to 15 ka. This terrace level represents a complex sediment body formed by river aggradation, which is covered by mostly Holocene flood sediments. It serves as a marker horizon to identify vertical displacement at a releasing fault bend of the Hluboká Fault and a releasing horsetail splay fault. We calculate vertical fault displacement velocities of ≥ 0.04 mm/a for the releasing bend of the Hluboká Fault and 0.14-0.18 mm/a for the splay fault. The calculated values only constrain the vertical slip velocity. The total oblique-dextral slip velocity of the Hluboká Fault is expected to exceed 0.04 mm/a significantly.