Evidence for a two-stage brittle tectonic evolution from fault analyses in the Horn Basin (SE Bohemian Massif)

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We provide an overview of faults and nappe boundaries mapped during the ongoing geological mapping project on sheet Horn in the southeastern Bohemian Massif. The tectonic boundary between the Moldanubian and the Moravian Superunit, the Moldanubian Thrust, roughly defines the northern and eastern margin of the Horn Basin structure. At this tectonic contact, Moldanubian mica schist overlies the Moravian granodioritic Bíteš Gneiss. However, younger brittle deformation produced the area's recent geomorphology. The eastern marginal faults of the Horn Basin have been the focus of brittle tectonics assessment. Several fault segments and smaller-scale faults were mapped in detail to gain an insight into the tectonic evolution of the basin. Faulting activity of the approximately N-S trending structures on the eastern margin was initiated by left-lateral strike-slip displacement along the NE-SW trending Diendorf Fault System. This resulted in antithetic Riedel shears, probably close to the brittle-ductile transition, with dextral strike-slip activity and associated vertical displacement. Causing also steepening of mica schist and Bíteš Gneiss foliation, this deformation phase mainly formed the tectonic windows of Moravian Bíteš Gneiss in Moldanubian rocks. Reactivation of the N-S trending faults during at least one younger deformational phase afterwards shaped the recent geomorphology of the basin. A roughly E-W directed extensional regime was observed at the eastern margin in many outcrops by means of tension gashes, conjugate joint sets and normal faults. Furthermore, altitude correlation of Oligocene—Neogene sediments proposes post Egerian–Ottnangian normal faulting activity, mainly westwards, during this late extensional phase. The evolution of the E-W orientated northern margin of the Horn Basin is less well known; clearly, it shows intense brittle deformation close to the Moldanubian Thrust. Brittle normal faults are either running E-W or represent NW-SE to N-S trending conjugate fault sets. The NW-SE trending ones presumably are the result of displacement along original joints, since joints mostly trend NW-SE or NE-SW and synkinematic quartz recorded oblique-slip shear sense. The creeks and valleys often seem to follow the NW-SE orientated brittle structures. Additionally, steep dip of mica schist foliation may indicate strike-slip activity along the E-W trending northern margin of the basin. Remnants of Miocene sediments again suggest later southward subsidence in or after early Eggenburgian times and Pleistocene to Holocene debris flows from the northern as well as the eastern margin of the Horn Basin reflect landscape response to faulting and denudation of the fault scarp. The investigations reveal a two-stage brittle tectonic evolution of the marginal faults of the Horn Basin. An early-stage brittle-ductile strike-slip activity, probably late Carboniferous to early Permian in age, could be shown for the N-S trending faults, which is most likely triggered by the Diendorf Fault System. The late-stage subsidence and basin formation took place during at least one extensional phase with displacement from Egerian–Ottnangian onward. The data on fault geometry, kinematics and, as far as possible, timing of tectonic activity, were added to the fault database of the Geological Survey of Austria (GBA).