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Western Eger Rift (Bohemian Massif): role of mantle lithosphere in the rift origin, its tectonic development and present geodynamic activity

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Lateral variations of seismic anisotropy modelled from spatial variations of P-wave delay times and the shear-wave splitting delineate three major mantle domains of the western Bohemian Massif. The domains exhibit different orientations of large-scale olivine fabrics and correspond to the major tectonic units – Saxothuringian (ST), Moldanubian (MD) and the Teplá-Barrandian (TB), originally separated microcontinents assembled during the Variscan orogeny (Plomerova et al., 2007). The Eger (Ohře) Rift (ER), an easternmost segment of the European Cenozoic rift system, developed above the ST-TB mantle boundary. Moreover, locations of the Cheb Basin, Quaternary volcanoes, crustal earthquake swarms and escape centres of exhalations of CO_2 and ^{3}He of mantle origin are controlled by a "triple junction" of the mantle lithospheres(Babuska et al., 2007). Cenozoic extension reactivated the junctions and thinned the crust and mantle lithosphere. The rigid part of the crust decoupled from the mantle lithosphere probably already in the Variscan and during the Cenozoic extension the rejuvenated boundaries (transitions) provided open pathways for Quaternary volcanism and the ascent of ^{3}He- and CO_2-rich fluids released from the asthenosphere. The deepest crustal earthquakes, marking an upper limit of a brittle-ductile transition in the crust, are shallower above the junction of the mantle blocks (at about 12 km) than above the more stable Saxothuringian mantle lithosphere (at about 20 km), probably due to a higher heat flow and presence of fluids. It is possible that many intraplate earthquakes in different continental regions are located at more or less

healed paleoplate boundaries.