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Western Bohemian Massif – long memory of mantle lithosphere fabric reflected in present-day geodynamic activity and surface topography

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Locations of the Eger Rift (ER), Upper Paleozoic and Cenozoic sedimentary basins, Quaternary volcanoes, crustal earthquake swarms, and escape centres of exhalations of CO_2 and ^{3}He of mantle origin, correlate with changes of tectonic fabric of the mantle lithosphere modelled from seismic anisotropy and with elongated thinning of the mantle lithosphere beneath the ER imaged in seismic tomography. We suggest that positions of the geodynamic phenomena and of parts of the sedimentary basins are controlled by boundaries of three mantle lithospheres distinguished by different orientations of their tectonic fabric modelled by hexagonal olivine aggregate consistently oriented within each unit. The three mantle domains most probably belong to the originally separated microcontinents - the Saxothuringian (ST), Tepla-Barrandian (TBU) and Moldanubian (MD) - assembled during the Variscan orogeny. Cenozoic extension reactivated their junctions and locally thinned the crust and mantle lithosphere. The boundaries (transitions) of three mantle domains provided open pathways for Quaternary volcanism and the ascent of ^{3}He- and CO_2-rich fluids released from the asthenosphere. Major tectonic feature of the region, the ER, formed along the ST-TBU mantle suture. Fundamental characteristic of the ER is the asymmetry of its flanks, both as to the lithosphere structure and the topography profile. It is possible that the asymmetric topography of the ER is related to the south-eastward oriented paleosubduction beneath the TBU and to large differences in the deep lithosphere structure of both ER flanks, which probably belonged to different microcontinents before being incorporated into the modern European landmass.