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Inherited fossil anisotropic fabric in mantle lithosphere domains of the Bohemian Massif

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Research of deep structure of the Bohemian Massif (BM) and other European regions exploits teleseismic data from dense temporary arrays of seismic stations. To study building elements of the BM we model 3D anisotropy and infer fabric of the mantle lithosphere by inverting jointly P-wave travel-time deviations and shear-wave splitting parameters from recordings of portable and permanent stations operating in the region for more than 20 years. Changes in orientation of the large-scale anisotropy, caused mainly by systematic preferred orientation of olivine, identify boundaries of domains of mantle lithosphere. Individual domains are characterized by a consistent large-scale orientation of anisotropy approximated by hexagonal symmetry with generally inclined symmetry axes (inclined foliation and/or lineation). We map five domains (microplates), each of them bearing a consistent fossil olivine fabric formed before their Variscan assembly. The domains are separated by tectonic boundaries (sutures) identified in the mantle lithosphere. The mantle domains correspond to major crustal units, but crustal and mantle boundaries are often shifted. The fabric of the northern and north-eastern BM is approximated best by peridotite aggregates with the (a,c) foliations dipping to the NNW and NE, respectively, whereas a model with the westerly dipping a lineation fits best the fabric of the south-eastern domain. The Saxothuringian fabric, NW of the Eger Rift, extends to the east across the Elbe Fault Zone (EFZ) and continues along this zone to the southeast beneath the Cretaceous Basin. The southeastward continuation of the Elbe Fault Zone seems to be related to the boundary between two different fabrics of the northern and southern parts of the Brunovistulian domain underlying the Moravo-Silesian zone. The anisotropy shows an underthrusting of the Brunovistulian micro-plate beneath the eastern rim of the BM and indicates that its northern and southern parts might represent lithosphere fragments originally belonged to Baltica and to Gondwana, respectively. Our findings support a plate-tectonic view of the continental lithosphere as a mosaic of rigid blocks of the mantle lithosphere with complicated but relatively sharp contact zones. These contacts are blurred by the easily deformed overlying crust terranes.