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Link of grabens and reactivated mantle boundaries in western Bohemian Massif

Vladislav Babuska, Jaroslava Plomerova, Ludek Vecsey, and Helena Munzarova
Institute of Geophysics, Academy of Sciences, Prague, Czech Republic (babuska@ig.cas.cz)

To study relations between mantle and crustal fabrics in the Bohemian Massif (BM), we model 3D anisotropy of the mantle lithosphere by inverting and interpreting jointly P-wave travel-time deviations and shear-wave splitting parameters of teleseismic waves recorded at portable and permanent stations operating in the BM for more than 20 years. Changes in orientation of the large-scale anisotropy in the mantle lithosphere, caused by systematic preferred orientation of olivine, identify boundaries of domains representing original micro-plates assembled during the Variscan orogeny.

Consistent anisotropy of the mantle-lithosphere domains, with distinct changes at their boundaries, documents rigidity and a long memory of pervasive olivine fabrics. Some of the palaeo-plate boundaries represent weak elements of the assemblage that can be later rejuvenated. This is why graben structures in the western BM developed above the identified mantle boundaries. The Eger (Ohře) Rift (ER) originated above the ENE oriented mantle suture between the Saxothuringian (ST) in the north-west and the Moldanubian (MD) and Teplá-Barrandian (TB) in the south-east. The most significant graben structure, accompanied by a rich Cenozoic volcanic activity, developed above the central part of the ST/TB suture that witnessed a subduction down to $\sim$150 km, as documented by findings of microdiamonds in ST granulites.

The smaller-scale NNW oriented Cheb-Domažlice Graben (CDG) is located above the mantle boundary between the western rim of the TB and the MD. Unlike the suture beneath the ER, this boundary does not show any sign of a deep subduction and it is characterized by a less well developed graben structure and a weak volcanic activity. In both grabens we observe local shifts between the equivalent crustal and mantle boundaries of the units as large as $\sim$20 km. The shift indicates a Variscan detachment of the crust from the mantle lithosphere. Cenozoic rifting and the graben structures developed preferably above the mantle boundaries, often away from the boundaries of the crustal units.