Geophysical Research Abstracts
Vol. 16, EGU2014-6024, 2014
EGU General Assembly 2014

Linking the Cenozoic Eger (Ohře) Rift architecture with the Variscan boundaries of mantle-lithosphere domains

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

Continental rifts are associated with normal faults and grabens and we want to show that such features within the intensively deformed crust relate to tectonics of the rigid mantle-lithosphere domains. The Eger (Ohře) Rift (ER) belongs to the European Cenozoic Rift System (Ziegler, Geologie en Mijnbouw, 1994) and to geodynamically most active regions in Europe. Besides Tertiary and Quaternary volcanoes, the neotectonic activity is primarily manifested by frequent earthquake swarms, as well as by a high flux of mantle derived CO_2 and 3He. Locations of these geodynamic phenomena correlate with fabrics of the mantle lithosphere and namely with boundaries of the mantle units. The boundaries are marked by a change of orientation of seismic anisotropy that reflects fossil olivine orientations within the originally separated microplates, assembled during the Variscan orogeny. Presently most active part of the rift is located above the mantle 'triple junction' of the Saxothuringian (ST), Teplá-Barrandian (TB) and Moldanubian (MD) units.

Central part of the ER, characterized by a massive Cenozoic volcanism, deep sedimentary basins and graben morphology, developed above the steep Variscan suture between the ST and TB units. The suture witnessed an oceanic subduction followed by underthrusting of the ST continental crust to a depth of $\sim$ 150 km, as was documented by findings of micro-diamonds in ST granulites (e.g., Kotková et al., Geology 2011). The central ER is limited to the SW by the Mariánské Lázně Fault (MLF) and to the NE by the Elbe Fault System (EFZ). Both fault systems correlate with the extent of the TB mantle lithosphere mapped by seismic anisotropy modeled from teleseismic P waves and shear-wave splitting recorded at a dense network of seismic stations. The secular TB side-down normal movement is reflected in deep sedimentary basins, which developed along the ST-TB mantle boundary since the Carboniferous to Cenozoic. The southwest continuation of the rift to Bavaria is expressed in occurrences of Cenozoic sediments and volcanics, without a graben morphology. A graben probably did not develop there because the region is situated above an inclined broad transition zone between the ST and MD mantle lithospheres. The NE continuation of the ER across the EFZ towards the Lusatian unit shows a feature similar to its southwest extension – an absence of a major graben. Volcanics and sedimentary basins are dispersed there in a broader region above the ST mantle lithosphere. There is no mantle boundary along the NE continuation of the rift, but the ST mantle domain seems to be shifted along the NE limit of the TB unit to the SE.

We suggest that the Variscan assembly of microplates and particularly a shape of their mantle boundaries controlled architecture of the crust, as well as the rift morphology and position of sedimentary basins.The pattern of interacting rigid plates of the mantle lithosphere, and namely their uneven boundaries and later rejuvenated contacts provided pathways for volcanic products.