

Crustal high-velocity anomaly at the East European Craton margin in SE Poland (TESZ) modelled by 3-D seismic tomography of refracted and reflected arrivals

Piotr Środa and Monika Dec

Institute of Geophysics, Polish Academy of Sciences, Warszawa, Poland (psroda@igf.edu.pl)

The area of Trans-European Suture Zone in SE Poland represents a contact of major tectonic units of different consolidation age – from the Precambrian East European Craton, through Palaeozoic West European Platform to Cenozoic Carpathian orogen. The region was built by several phases of crustal accretion, which resulted in a complex collage of tectonic blocks. In 2000, this region was studied by several seismic wide-angle profiles of CELEBRATION 2000 experiment, providing a dense coverage of seismic data in SE Poland and allowing for detailed investigations of the crustal structure and properties in this area. Beneath the marginal part of the EEC, the 2-D modelling of in-line data from several CELEBRATION profiles revealed a prominent high P-wave velocity anomaly in the upper crust, with V_p of 6.7–7.1 km/s, starting at 10–16 km depth (e.g., Środa et al., 2006). Anomalously high velocities are observed in the area located approximately beneath Lublin trough, to the NE of Teisseyre-Tornquist Zone. Based on 3-D tomography of first arrivals of in- and off-line CELEBRATION 2000 recordings (Malinowski et al., 2008), elevated velocities are also reported in the same area and seem to continue to the SW, off the craton margin. Gravimetric modelling also revealed anomalously high density in the same region at similar depths. High seismic velocities and densities are interpreted as indicative for a pronounced mafic intrusion, possibly related to extensional processes at the EEC margin. Previous 3-D models of the high-velocity intrusion were based on first arrivals (crustal refractions) only. In this study, also off-line reflections (not modelled up to now) are used, in order to enlarge the data set and to better constrain the geometry and properties of the velocity anomaly. A code for 3-D joint tomographic inversion of refracted and reflected arrivals, with model parametrization allowing for velocity discontinuities was used (Rawlinson, 2007). With this approach, besides the refractions from the anomalous zone, also the off-line reflections from the top of the intrusion were used for inversion. Presented results provide new information about the depth and horizontal extent of the high-velocity intrusion. The model is also compared with other seismic studies of similar velocity anomalies observed at continental margins.