CELEBRATION 2000: P-WAVE VELOCITY MODEL OF THE BOHEMIAN MASSIF (CEL 9)

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In the framework of Celebration 2000 seismic refraction project, an international scientific experiment aimed at investigation of deep lithospheric structure of Central Europe, regions with different tectonic development such as Precambrian East European Craton, Trans-European Suture Zone, Carpathian Belt, Bohemian Massif and Pannonian basin was studied. The fieldwork for the project was completed in June 2000, when 147 shots were fired along most of the recording profiles with total length of about 8900 km, which resulted in obtaining of 160,000 seismic records.

The region of the Bohemian Massif BM was studied along two refraction profiles, CEL09 that traverses the whole massif in the NW-SE direction and CEL10 that extends along its eastern edge perpendicularly to CEL09. The respective seismic sections on the profiles in the BM show good quality recordings with clear first arrivals of crustal and mantle phases, Pg and Pn waves resp., usually up to the distance of 250 km. The Pg waves are observed at offsets to about 150 km with apparent velocity 5.9 km/s with slightly higher gradient in NW part of the BM. At larger offsets, Pn waves can usually be observed with apparent velocity of 8.0 to 8.1 km/s. In some sections, higher attenuation of energy of Pg phase is visible at distances between 90 – 130 km, which may be connected with a specific upper crustal structure (low velocity gradient zone). PmP waves as reflections from Moho are well visible in the central part of the BM – Moldanubian, which suggests well defined Moho in that part, and not so clear Moho with smaller velocity contrast in other parts of BM.

For interpretation, the tomographic inversion routine of Hole (1992) was used as an efficient tool to determine the seismic P-wave velocity distribution in the crust using first arrivals. The tomographic models were verified by forward ray tracing modelling, where apart from first arrivals also further phases were included. This method was based on wellestablished algorithm developed by Červený and Pšenčík (1983) elaborated in further modifications by Zelt (1994).

2-D velocity model of first arrivals and reflected phases shows high P-wave velocity gradient zone reaching the depth of 5-7 km followed by small gradient and laterally homogeneous P-wave velocity in the lower crust. Position of Moho discontinuity ranging from 32 km to 40 km and reflectors within the crust complements the P-wave velocity distribution. Differences in the character of velocity distribution not only in the upper crust but also in lower crust delimits central part - Moldanubian and related tectonic units within the BM.

References:

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