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Deep Structure of the Lithosphere in the Western Part of the Bohemian Massif

Vladislav BABUŠKA and Jaroslava PLOMEROVÁ

Geophysical Institute, Academy of Sciences of the Czech Republic, Boční II, 141 31 Praha 4, Czech Republic

In seismological studies, the lithosphere is defined as a high-velocity outer portion of the Earth comprising the crust and the uppermost mantle down to the low-velocity zone, i.e., to the top of the asthenosphere. In the western part of the Bohemian Massif (BM), we modelled the thickness and large-scale fabric of the subcrustal lithosphere from variations of P-wave delay times (residuals) and the shear-wave splitting observed at seismological observatories and several portable stations. Generally speaking, positive relative residuals are observed in regions with thin lithosphere and, on the other hand, negative residuals represent regions with an abundance of the high-velocity lithospheric material.

An independent estimate of the lithosphere thickness is provided by magnetotelluric measurements. The lithosphere thickness of the Variscan belt in central Europe varies between 80 and 140 km in the seismological model (Babuška and Plomerová 1992). These estimates are in accord with depths between 100 and 150 km for a layer of increased electrical conductivity (Praus et al. 1990). The thinnest lithosphere is observed beneath a broader zone of the Saxothuringian–Moldanubian (S/M) contact, which continues eastward beneath the Ohře Graben and westward towards the Rhenish Massif. North of the S/M contact, the lithosphere thickens to about 100–120 km. The most spectacular lithospheric thickening to about 150 km (Fig. 1) south and southeast of the S/M contact was inferred both from the seismological and magnetotelluric data.

There are two basic patterns – the Saxothuringian and Moldanubian – which can be recognized from spatial variations of relative P residuals. The Saxothuringian pattern is characterized by negative residuals (early arrivals) mainly for waves arriving from the N-NW and positive residuals (late arrivals) for waves arriving from the S-SE. The Moldanubian pattern is reversed – the fast velocity directions are oriented to the S.

Plomerová et al. (1998) studied the 3-D orientation of anisotropy and its lateral changes. The joint analysis of the P-residual spheres and the shear-wave splitting parameters resulted in a self-consistent 3-D anisotropic model of the lower lithosphere beneath a broader zone of the S/M transition (Fig. 1, Babuška and Plomerová 2000). Our observations clearly indicate that a distinct change in the lithospheric anisotropy relates to the deep suture which cuts the whole lithosphere thickness and separates both units. We can associate the S/M contact with a litho-

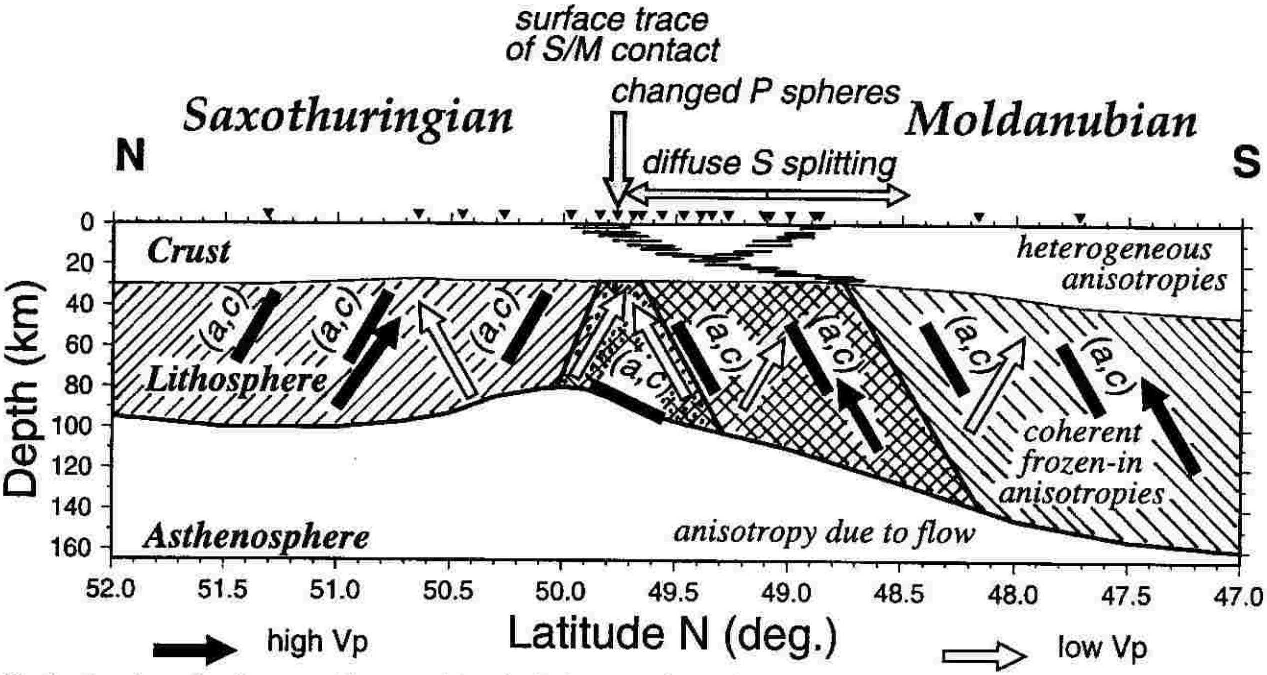

Fig. 1. A cartoon showing a model summarizing the body-wave observations of seismic anisotropy and their interpretation in terms of large-scale fabric. The region of „mixed“ subcrustal lithospheres of both tectonic units is cross-hatched. A region of lower velocities beneath the surface trace of the S/M contact is stippled. Thick bars indicate dipping (a,c) foliation planes of the model peridotite aggregate. DEKORP 4 crustal reflections (Gebrande et al. 1989) are schematically shown by dense hatching.

spheric thinning to about 80 km, as well as with a gradual change of the pattern of P residuals marked by rays propagating from the south and north. The region south of the lithospheric thinning may correspond to a hypothetical thinned and weakened rift lithosphere in the Early Paleozoic (Schulmann et al. 2000), underthrust beneath the Moldanubicum after ocean closure in the Late Paleozoic (Franke and Oncken 1990). The south-oriented underthrusting or subduction of a mature Saxothuringian deep lithosphere beneath the younger and softer Moldanubian block in the westernmost part of the BM, modelled from our data, is in accord with many geological and geophysical observations in this region.

Studying the deep structure across the S/M contact, we have observed the thinnest lithosphere as well as a major change in the anisotropy pattern in the direct continuation of the Ohře Graben west of its limits. We can thus assume that the Variscan S/M suture was a predisposition of the Tertiary rift structure, which developed along the northern margin of the Teplá-Barrandian Unit.

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Pannonian Zone E Basin-Margin Parasequences (Danube Basin, Slovakia)

Ivan BARÁTH

Geological Institute, Slovak Academy of Sciences, Dúbravská 9, 842 26 Bratislava, Slovak Republic

Sandy-clayey sediments of the Pannonian biostratigraphic zone *E* in the Pezinok clay pit at the eastern margin of the Danube Basin are well known paleontologically. The aim of this work is to reconstruct the history of changes in sedimentary environments in terms of sequence stratigraphy.

The new sedimentological and paleontological data reveal interrelationships between different sedimentary paleoenvironments and allow to distinguish seven facies associations (FA) within the 35-m thick exposed sedimentary succession: back-barrier transgressive FA, transgressive sand sheet FA, shallow offshore FA, beach-ridge FA, marsh FA, lagoonal FA and alluvial plain FA.

Both the vertical and horizontal changes in facies associations reflect the relative changes in standing water level. Six lacustrine cycles were interpreted in the lower part of the key sedimentary log. The upper part of the section is dominated by alluvial sediments, where the recognition of cyclicity is rather complicated due to many erosional events, and more data are needed.

In the lowermost part of the key log, medium-grained cross-stratified sands are interpreted as upper wave-dominated delta-front beach-ridge deposits. Their upper surface, acting later as a transgressive surface, is rippled and bioturbated by fossil plant roots.

The overlying composite back-barrier transgressive facies association marks the beginning of the first recognized sedimentary cycle. The facies consists of grey to green laminated silty clays and homogeneous clays with an organic-rich black horizon. A sandy washover-related intercalation is also visible in these clays. The upper surface of the back-barrier transgressive sediments is truncated by a transgressive sand sheet. The truncation plane is interpreted as a ravinement surface, which is covered by a 3–10 cm thick, shell-rich sandy layer, representing a transgressive winnowed lag, marking a unconformity due to shoreface retreat.

The following transgressive unit consists of silty sands to very fine sands with regular intercalations of clayey silts, deposited in the lower-shoreface environment. This facies is gradationally overlain by coarser sands of upper-shoreface origin, representing the beach-ridge facies association with abundant carbonised roots.

This cycle is topped by a lignite layer with up to 1 m thick tree trunks, originated in a forested marsh environment, documenting the initial transgressive unit of the second cycle. The overlying greenish-grey laminated sandy clays, rich in roots, wood and plant fragments are interpreted as originated in back-barrier landward position, in freshwater swamps and ponds, during the initial transgression phase. The upper portion of these sediments is truncated (ravinement surface) by a fossil-rich lag with sandy matrix, which is abruptly overlain by hummocky cross-stratified fine sands of lower-shoreface origin, representing a transgressive facies association.

The upper part of the cycle is missing due to the interpreted