non-carbonate lithoclasts such as phosphorites and Frasnian corals, indicate erosion of the source area and a sudden influx of terrigenous material due to tectonic uplift and subsequent relative sea-level lowstand. The breccias started to expand towards SE to emerge successively near Grygov (Moravian Karst facies belt) at the Si. isosticha-Upper Si. crenulata / Gn. typicus boundary (approx. 354 to 356 Ma), and finally in the Hranice n. M. area and in broader vicinity of Lesní lom near Brno in the Late Tournaisian (352 to 353 Ma). In all the localities above, this conspicuous carbonate facies commonly precedes the onset of siliciclastic flysch sedimentation of Culm facies, indicating a sudden switch-over from extension to compression. Considering the rate of propagation of this indicator of tectonic compression in direction perpendicular to the tectonic strike, allowing for the absolute ages of its emergence in particular localities, we can roughly estimate the original distance between the localities. The rate of propagation of tectonic compression was assumed approximately equal to the rate of subduction (derived from recent subduction rates taken from 10 locations world-wide, varying from 2 to 12 cm/yr., with arithmetic mean of 7.1 cm/yr.). The average estimate of the pre-Middle Tournaisian distance between the innermost and outermost accommodation sites for the breccias (Jesenec and Hranice or Lesní lom, respectively) is 230 km, with maximum and minimum of 720 km and 0 km, respectively, taking the present-day distance perpendicular to the tectonic strike (50 km) into account. This is not in direct contradiction with the palinspastic reconstruction of the Moravian-Silesian basin presented by Hladil (1994).

References

ARMSTRONG A.K., and MAMET B.L., 1977. Carboniferous Microfacies, Microfossils, and Corals, Lisburne Group, Arctic Alaska. *Geol. Surv. Prof. Paper*, 849. Washington.

EBERLI G.P., 1987. Carbonate turbidite sequences in rift-basins of the Jurassic Tethys Ocean (eastern Alps, Switzerland). *Sedimentology*, 34: 363-388.

EBERLI G.P., 1991. Calcareous turbidites and their relationship to sea-level fluctuation and tectonism. In: G. EINSELE, W. RICKEN and A. SEILACHER (Eds.), Cycles and Events in Stratigraphy. Springer-Verlag, Berlin, pp. 340-359.

HLADIL J., 1994. Moravian Middle and Late Devonian buildups: evolution in time and space with respect to the Laurussian shelf. *Cour. Forsch.-Inst. Senckenberg*, 172: 111-125.

KALVODA J., BÁBEK O., NEHYBA S. and ŠPAČEK P., 1996. Upper Devonian and Lower Carboniferous calciturbidites from the Lesní lom quarry in Brno-Líšeň (southern part of the Moravian Karst). *Geol. Výzk. Mor. Slez. v R. 1995*: 98-100. (In Czech, English summary)

REIJMER J.J.G., TEN KATE W.G.H.Z, SPRENGER A. and SCHLAGER W., 1991. Calciturbidite composition related to exposure and flooding of a carbonate platform (Triassic, Eastern Alps). *Sedimentology*, 38: 1059-1074.

SCHLAGER W., REIJMER J.J.G. and DROXLER A.W., 1994. Highstand shedding of carbonate platforms. *J. Sedim. Res.*, B64, 3: 270-281.

WINTERER E.L. and BOSELLINI A., 1981. Subsidence and sedimentation on Jurassic passive continental margin, Southern Alps, Italy. *Bull. Am. Ass. Petrol. Geol.*, 65: 394-421.

Phase Petrological Study of the Bohemicum/Moldanubicum Boundary Zone (an Example from its Westernmost Part at the Czech/German State Border)

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Mineral assemblages from both metapelitic and metabasic rocks of the Bohemian and Moldanubian Units were studied.

Metapelites from the Neukirchen–Kdyně massif (Bohemicum) and from the area of Železná Ruda (Markt Eisenstein, Moldanubicum) comprise remnants of prograde, medium-pressure metamorphic evolution. Garnet–staurolite–kyanite–sillimanite succession is typical of these rock types. The age of this MP is taken as about 380 Ma (Kreuzer et al. 1989).

Low-pressure metamorphic assemblages have a dominant position in Moldanubicum to the S of the Central Bohemian Shear Zone (CBSZ) in the form of either crd–fsp migmatites in the major parts of Moldanubicum, or of nearly periplutonic to contactly metamorphozed mica schists in the Královský Hvozd Unit (KHU) (Moldanubicum), with and–crd non-migmatized rocks. Age of this event is considered to be about 320 Ma (Kreuzer et al. 1989).

An important crustal domain was distinguished in the close neighbourhood of the CBSZ, positioned to the S of CBSZ. Grt–chl schists and granitic mylonites conserve a PT-path position of 420–450 °C / 8–10 kb (Babůrek 1995). Neither the rare chloritoid-bearing mica-schists with Ca-saturation and plagioclase of the two different compositions (An_{01}–An_{31-23}) reached peak temperature conditions of 500 °C. Thus, this exotic crustal domain with MP–HP/LT metamorphic record and areal size of approximately 3 by 2 km, rimmed by tectonic faults or by the Central Bohemian pluton, either conserves the former metamorphic history of the Moldanubicum (and/or Bohemicum?), already overprinted in other parts of these units, or represents an absolutely different block of the crust. Very high X_{Mg} of chloritoid (0.22) included in garnets of the Ostrý (Osser) mica-schists in the KHU south of this transitional domain, and the similar structural features of the KHU and this domain, argue for the first mentioned possibility as X_{Mg} of chloritoids of intermediate pressure conditions should not exceed the value of 0.15 (Spear 1993).

References

BABŮREK J. 1995. High, medium and low pressure assemblages from the Czech part of the Královský Hvozd Unit (KHU) in the Moldanubian Zone of SW Bohemia. *J. Czech Geol. Soc.*, 40/1-2: 115-126.

KREUZER H., SEIDEL E., SCHÜSSLER U., OKRUSCH M., LENZ K.L. and RASCHKA H. 1989. K-Ar geochronology of different tectonic units at the northwestern margin of the Bohemian Massif. *Tectonophysics*, 157: 149-178.

SPEAR F.S. 1993. Metamorphic Phase Equilibria and Pressure-Temperature-Time Paths. MSA Monograph, 799 pp. Washington, D.C.

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

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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-

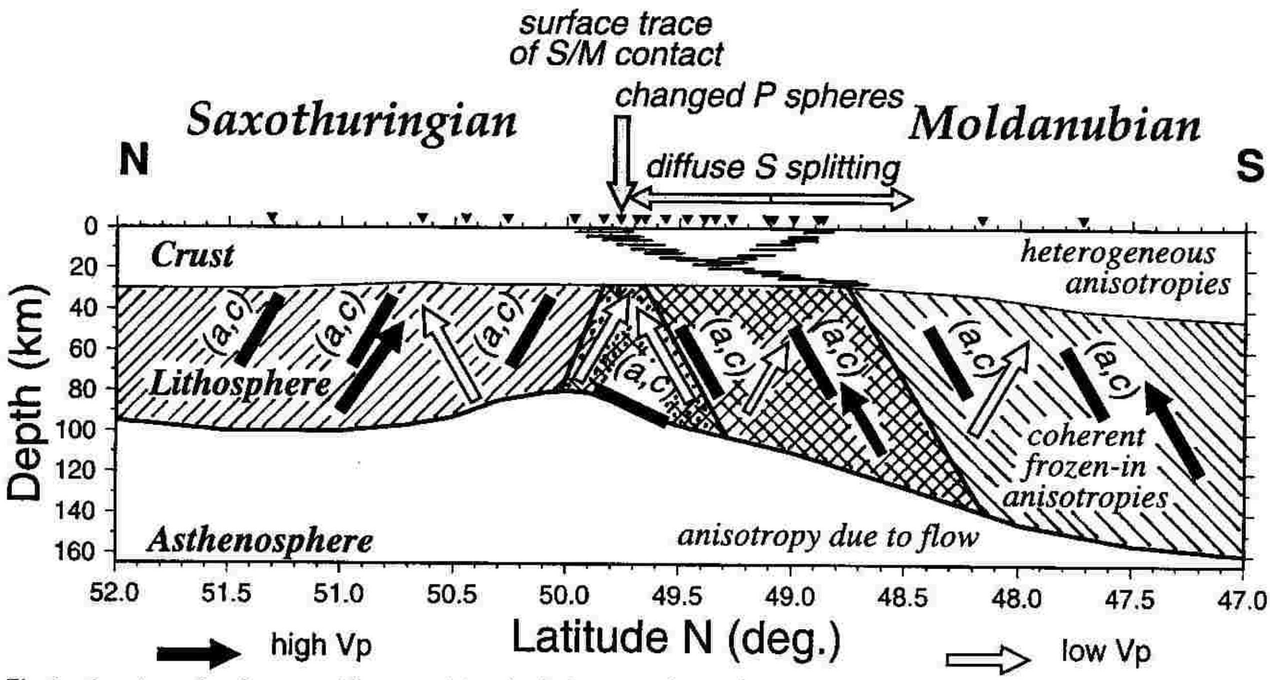

Fig. 1. A cartoon showing a model summarizing the body-wave observations of seismic anisotropy and their interpretation in terms of large-scale fabric. The region of „mixed" subcrustal lithospheres of both tectonic units is cross-hatched. A region of lower velocities beneath the surface trace of the 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.