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Intracrustal manifestations of the basalt layer in the development of the Moravian block

JAROSLAV WEISS

Department of Geology and Paleontology, Faculty of Science, J. E. Purkyně University Brno 611 37 Kotlářská 2

(1 figure in the text)

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Интракрустальные проявления базальтового этажа в развитии Моравского блока

Если обсуждаем возможность наличия базальтов и ультрабазальтов в пространстве моравского блока с точки зрения геологического синтеза, устанавливаем их прямое отношение к тектогенезу и одновременно формовочному анализу базальтового этажа. И по геофизическим данным является пространственное размещение очевидное в зонах тектонической передиспозиции и назначает возможность — если берём во внимание близость поверхностного действия периферии ледницкого и пржибиславского разлома — транспорта этих ультрабазитов в интракрустальные, или даже в субпракрустальных частей земной коры моравского блока. Поэтому является заметным, что основные и ультраосновные породы юговосточной части Ческого массива имеют тесное отношение к базальтовому этажу или верхнему плащу.

Intracrustal manifestations of the basalt layer in the development of the Moravian block

Considering the occurrences of basic and ultrabasic rocks in the area of the Moravian block from the viewpoint of its general structure, a close relation may be deduced between tectogenesis and shape properties of the basalt layer. Geophysical data confirm the disposition of basites along tectonic zones and point to the transport of ultrabasites into intracrustal and, eventually, even supracrustal levels along the Lednice and Přibyslav deep-seated faults. Hence the basic and ultrabasic rocks along the SE periphery of the Bohemian mass reveal close relations to the basalt layer or eventually to the upper mantle.

The Earth's crust overtakes crucial function in endogenous processes. Decisive role is played by dynamics of intracrustal portions in the crust so in relation to deep-seated processes as by the generation of tectonic discontinuities originating exclusively in supracrustal parts of the Earth.

Characteristics of the basalt layer

The part of the Earth's crust occurring between the C- and M-discontinuities is called the basalt (or gabbro) layer in the literature. Its behaviour is known mainly from geophysical data whereas the geological nature is approached by a whole set of models.

According to geophysical data, this basalt layer appears heterogenous as is the whole crust composed of low and high velocity zones or channels of both horizontal and vertical attitude. The usually indicated span of seismic wave velocities between the lower and upper boundary of this layer (neutrally assigned using the Bullen's model sometime as the A_2 layer) is 6.1—7.1 km . s^{-1} for P-waves and 3.6—4.2 km . s^{-1} for S-waves. The boundary towards the higher layer is not everywhere pronounced and there are already several examples when the Conrad-discontinuity may not be identified (e. g. for Czechoslovak territory; Zoubek — Vyskočil, 1971, Beránek et al., 1971). Views appeared in this connection that the layer may be composed of more peridotitic rocks than basalts. The basic division of the basalt layer as done by H. H. Hess (1955) distinguished four models: peridotite — gabbro, peridotite — amphibolite, peridotite — granulite and granulite — eclogite. The nature of the basalt layer is usually explained setting out from its physical properties but even more from its composition. From the compositional point of view, the basalt layer is assumed to represent a complete ophiolite suite *sensu* Peive (1974) or Coleman (1977). This view is substantiated by concrete data obtained through ocean floor dredging and, peculiarly, by the detailed knowledge of rocks drilled by the deep drilling on Kola peninsula in the USSR.

Practical experience leds us to an important problem: seismic horizons with boundary velocities of 6.6—7.2 km . s^{-1} contradict, even in well distinguished places, to the presumed attitude of the upper boundary of the basalt layer. Downwards from this boundary, there are layers in the crust in which seismic velocities correspond still to granite. Therefore the distinction of the upper boundary of the basalt layer is made using the elastic but not boundary velocities.

Seismic horizons with elastic wave velocities of 6.5—7.2 km . s^{-1} may directly not be ascribed to the Conrad-discontinuity but to layers of overwhelmingly basic rocks. Therefore if seismic horizons with velocities of 6.6—7.2 km . s^{-1} do not reflect the upper boundary of the basalt layer then, in fact, may represent some of crustal horizons vhere the composition is still granitic nevertheless already considerable amounts of basic or ultrabasic rocks occur. Seismic velocity values are usually not high enough to presume a general continuity between such zones and the upper mantle. Namely this pattern is pointed out by Wyllie (1976) who strongly disputes the presumption that each gabbroic body, or even every inclusion of basic and ultrabasic composition, could be derived from a mantle source. Rather a crustal origin is maintained and substantiated also by geochemical aspects (Weiss 1971).

It may be supposed that more properly are the factological data (attenuated crust, presence of ultrabasics, thickening of the basalt layer, gravimetric and frequently even magnetic highs) deduced from seismic indications and interpreted by the means of lamellae (Meissner, 1967) or pillows (Khropotkin, 1973, Moisseenko, 1975) characterizing different (more dense or quick) physical parameters.

In analogy to the Earth's crust, also in the case of basalt layer, two subtypes are distinguished: continental and oceanic one. In the continental type of basalt layer, also comprimed types of acidic plutonites and metamorphics are present whereas rocks of the ophiolite suite prevail in the oceanic one. Nor the presence of acid volcanites may be excluded from the latter.

In the continental type, physical manifestations of a two-layer basaltic crust occur in Europe and America mainly in areas of crustal thickening (e. g. beneath the Alps). P-wave velocities are here about 7 km . s^{-1} or sometime higher. The layer usually is assigned as a "high-velocity" one. Probably, basic rocks participate on its composition namely basaltoids splitted from the mantle and creating the pillow-shaped bodies mentioned. Basalts as rocks of lighter densities in comparison with the deeper mantle may heighten the overlying crustal blocks and so induce rejuvenated lifting of units earlier stabilized. It may not be excluded that the high velocity layer is part of the upper mantle from the time of differentiaton. The residual heavy masses occur, after the splitting of basaltoids, in greater depths and are reflected by "normal" mantle velocities of P-waves. Evidently, the crust does not consist only of a layered basalt seam filling up the whole space between C- and M-discontinuities. Under the rocks of basaltic, or according to velocities of similar, composition and situated near to the C-discontinuity, there also rocks of granitic character appear in crustal sections. This pattern substantiated in the Ukrainian shield and Bohemian mass or elsewhere is not a local symptom but evidently a certain rule. Hence this aspect must be kept in mind even when investigating the nature of the basalt layer in the Moravian block.

Geological interpretation

The increased accumulation of ultrabasite bodies in the Moldanubicum of the Moravian block reflects processes within its infracrustal portion. Results of recent seismic and gravimetric investigations allow to interpret the spatial distribution of ultrabasite bodies in relation to the shape of the basalt layer or, eventually, with the upper boundary of the upper mantle.

The vertical infracrustal model of the Moravian block reveals variegated and specific distribution of velocities (Beránek et al., 1975). Velocity gradient in the Moravian block may be observed near to its western and eastern margin. The cause is that a layer of higher velocities has been found from the Přibyslav deep-seated fault eastwards emerging further towards the western margin of the Moravicum up to about 15 km depth. Beneath this zone, a layer of lower velocities occurs again. Therefore the apparent increased thicknes of the basalt layer is here compensated by low-velocity channels situated, in the Moravian part of Moldanubicum, in 22—34 km depths. Below the zone of high velocities, rocks of lower velocities (6.6 km . s^{-1}) may be observed along the western periphery of the infracrustal part of the Moravian block what points to the presence of sialic rocks under the rocks of the basalt layer. An analogy with the Ivrea zone is therefore highly probable. Differences in contrast with the position of the latter are only that rocks of the basalt layer did not emerge into high crustal positions as is the case in the Ivrea zone (Weiss, 1977).

Velocity distribution models of the crust in the Bohemian mass and West Carpathians (Beránek, 1975) together with results of geophysical investigations along their contact (Beránek — Adam, 1975) allow to interpret piling up of basic and ultrabasic rock masses in relation with the Lednice deep-seated fault. The basites represent rocks dredged tectonically or magmatic masses intruded into higher levels along the disjunctive structure represented by the Lednice deep-seated zone.

Adam et al. (1976) assumed the Lednice deep-seated fault to have characteristic pattern of a fault limiting megablock margin: it acquires linearity of mobile belts and spatially broadens its mobility (occurence of basics and ultrabasics). The fault is characteristic also by marginal depressions in the Alpine-Carpathian foredeep (Upper Morava dales) developing allways upon consolidated blocks. A pronounced downfaulting of the autochtonous basement relief is indicated by both refractive and reflexion profile data from the supracrustal portions. Northeasternly from this structure, the autochtonous basement is interpreted in about 2 km depth whereas it merges gradually into more than 7 km southeastwards. This merging is due to the function of the Lednice deep-seated fault.

Owing to the anomalous distribution of velocities, the dragging out of the Carpathian basalt layer is interpreted, on Czechoslovak territory, in the space of the Lednice deep-seated fault (Beránek — Dudek, 1977, Beránek, 1978). The obduction of the Carpathian basalt layer may be caused by the subduction movement of the Bohemian mass. According to the authors indicated, apical portions of the basalt layer occur in 10 km depth below the recent surface and only 2 km below the surface of the crystalline basement.

Hence the belt of higher velocities related to supracrustal parts of the Lednice deep-seated fault zone may be explained by the presence of rocks of the basalt layer. The disturbed magnetic field correlates even well with such meaning. The Lednice fault is also indicated by a sharp change in thicknesses of flysch nappes deduced from both refractive and reflexion seismic profile data.

The geological model of the Moravian block (fig. 1) reveals southeastward attennuation of the crust whereas the Moho-discontinuity strongly rises. In the western part of the Moravian block, rocks with higher velocities already characteristic for the basalt layer occur in 15 km depth. Underneath again rocks of granitoid character appear in the velocity pattern. The feature may be explained by upthrusting of the Moldanubian block over the Moravian one whereas rock masses of the basalt layer have been squeezed-out into the uper portions of the downfaulted Moravian block. The oncoming of the basalt layer into upper crustal levels may be placed in the space between the eastern margin of the Třebíč durbachite massif and Brno massif. Besides velocity data, this solution is substantiated even by densities (gravimetric high) and, particularly, by the extensive regional positive magnetic anomaly in the 1 : 1.000,000 scale aeromagnetic map. All data coincide well with the frequency of ultrabasite occurrences in supracrustal portions of the Moravian block here.

The main distribution of NW—SE trending elevation and depression structures appears even in the general geological picture. Gravimetric data prove the coincidence of elevation structures (western part of the Moldanubicum, Krušné hory Mts.) with gravimetric minima and that of depressions (Barrandian, Saxothuringian) with gravimetric highs (Beránek et al., 1980). The character of such regional gravimetric anomalies is influenced just by changing thicknesses of the basalt layer. Its dissected upper boundary and proximity to the recent surface is conspicuous along the eastern margin of the Moldanubicum where the coincidence with frequent occurrences of basite and ultrabasite bodies allows to assume a collision belt of the Variscan orogen with the older crystalline of Brunovistulicum.

The large regional anomaly along the contact of the Bohemian mass and West Carpathians could be interpreted as being related to the emplacement of ophiolite suite rocks along the Lednice deep-seated fault into supracrustal levels. This fault so represents a peripherial structure to the Bohemian megablock unit and to the Central European Epivariscan platform.

Manifestations of the basalt layer

Several bodies of basic and ultrabasic rocks contained in the Moravian block represent in fact segmented and metamorphosed members of originally ophiolitic associations derived from oceanic crust and upper mantle. If based on relations between the pyrope peridotites and eclogites in the Moravicum, it may be further deduced their pertaining to a metaophiolite association and together with the latter allways to a continental crust.

An exception to this rule is represented particularly by the position of the Letovice synform (Mísař, 1979) consisting unambiguously of rocks of tholeiitic magma affinity where distributions of Ti and Cr point to ocean floor basalts (Jelínek et al., 1978). According to the mafic index and silica content, ultrabasites fall into the field of ultrabasic cumulates or gabbros whereas the majority of amphibolites has figurative points in the field of basic cumulates of typical ophiolite complexes. Accordingly, basites and ultrabasites of the Letovice crystalline may be regarded, with high probability, to represent members of a metamorphosed ophiolite suite of Proterozoic age (Mísař, 1966, 1979).

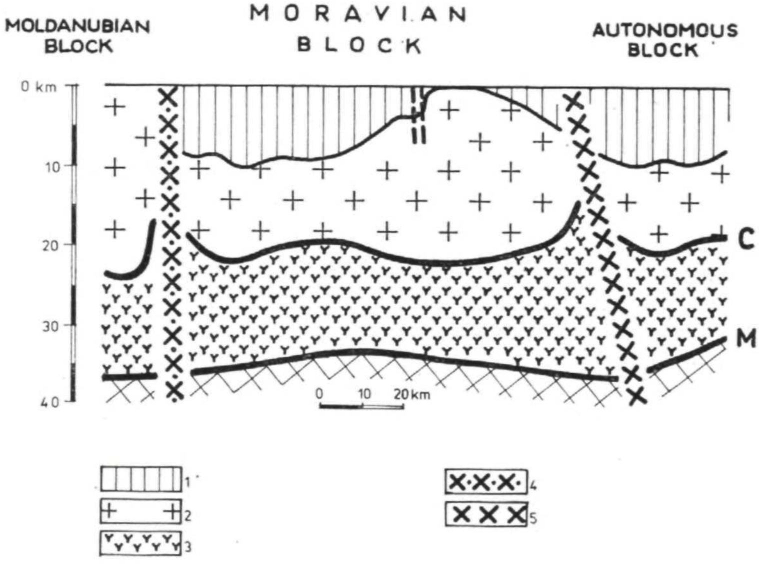

Fig. 1. Geological model of the Moravian block. 1 — crystalline complex, 2 — 2 — granit layer, 3 — basalt layer, 4 — Přibyslavice deep fault, 5 — Lednice deep fault

The Moravian block is limited from the west by the Přibyslav deep-seated fault. The existence of this fault, creating eastern marginal fault to the Central Moldanubicum mass, is definite according to seismic and gravimetric data. With the highest probability, the upvaulting of the basalt layer is also due to this deep-seated fault representing by its main characteristics a crucial marginal zone of the Moravian block of intra- to subcrustal range. In surficial crustal portions, it is accentuated by mylonites associating, besides ultrabasic rocks, also with eclogites and amphibolites. The Přibyslav deep-seated fault is of general metallogenetic importance as proved by numerous ore manifestations in Czechoslovakia (near Staré Ransko), Austria (Waldkirchen) and even in Poland.

Ultrabasites present in the central part of the Moravian block complicate the pattern of the magnetic field by reaching amplitudes up to several hundreds γ (Šalanský et al., 1967, Šalanský, 1972). This intricated pattern and sharp gradients of the field together with frequent superposition of magnetic sources in several levels result in such configuration of isoanomalies which, as the rule, could by no means completely reflect the cartographically ascertained surficial distribution of ultrabasite bodies. It is however really to assume considerably larger extent of ultrabasics in supracrustal levels e. g. westernly from Jevišovce, near Dukovany (Weiss, 1975) or near Dalešice (Weiss, 1971).

These relations are reflected also by the more dissected course of the basalt layer upper boundary, by its gradual eastward thickening and approaching the surface-near parts of the crust. In this case hence the interconnection of single ultrabasite occurrences in the depth is provable. What concerns the original continuity of basic and ultrabasic rock bodies to the upper mantle, a certain criterion may be their greater frequency in the Moldanubic part of the Moravian block. Results of detailed airborne geophysical measurements drew attention, besides numerous geophysical data, also to the regular distribution of ultrabasites within the Moravian block. Ultrabasite bodies appear as well expressed anomalies in the aeromagnetic picture. In the case of areally larger bodies (Bory, Borovník, Březí and Mohelno), data may be deduced for their depthward extension, dip etc. Besides these, geophysical data allow to trace some further occurrences within tectonic zones, namely the blind bodies without surficial outcrops due to their occupation of deeper crustal levels in the enclosing metamorphics or covered by thicker sediments of Quarternary or less Cenozoic age. Such ocurrences are namely in the Moldanubicum near Strážek.

The examination of geophysical results and recent geological data allow to assume effects of subsequent deformations on ultrabasite massifs expressed mainly by faulting (tectonic contours of some bodies are evidently observable) and vaulting (undulations) induced probably by folds of great amplitude and small heigh index.

The basite body on Moravské kopce locality westernly from Olešnice in Moravia consists, from petrographical point of view, of different amphibolite varieties (located in uppermost levels of the gneiss complex according to Mísař, 1966) and olivine gabbros. The presence of the latter is of peculiar meaning when assuming the model of deep origin for the Olešnice dome. Olivine gabbros from the Olešnice area represent, by internal fabric and geological setting, equivalents of analogous basic magmatites in the Moravian block (Weiss, 1957). A certain similarity in structural position may be observed by the

Uherčice gabbro (Němec, 1935) or by the olivine gabbro body in Železné near Tišnov (Rosický, 1926).

Westward from the Boskovice furrow, the lower boundary of the granite layer rises continuously to 15 km whereas the lower boundary of the basalt layer occurs in almost 35 km depth. The Boskovice furrow, in analogy with the Blaník one, has but supracrustal range though some authors assumed it to be reflection of a deep-seated fault (Jaroš — Mísař, 1965, 1967, Zeman, 1974, 1975. Such explanation seems to be supported by the sharp submergence of the Moho westernly from the furrow into almost 37 km level at the western margin of the Lednice deep-seated fault.

Granitoids of the Brunnia mass composing the Brno massif proper and creating part of the substructure in the entire eastern margin of the Moravian block as far as the Lednice deep-seated fault originated in the time of Cadomian orogenic cycle. Most of magnetic anomalies are created by intermittently magnetized horizons in the area. Anomalous belts, part of which is dissected into the mosaic of blocks, point to strong faulting and accomodate to, in a certain degree, the function of the Lednice deep-seated fault. The strike of single belts is not constant and, also due to the shattering of single block units, a gradual bending from N—S to SE is observable, i. e. into the area of the Carpathian foredeep.

From a regional point of view, such magnetized horizons in the Brno massif and representing more or less altered basic and ultrabasic rock varieties, are spatially cumulated in a metabasite belt. Some authors relate this weakened zone to gabbroic rock occurrences the Svitavy anomaly including (Čuta et al., 1964) in contrast to others denying relations with the Svitavy magnetic anomaly and, namely, with the gravimetric high (Mísař et al., 1972, Weiss, 1977).

In the eastern part of the Moravian block but mainly in the autochtonous block unit covered by Paleozoic, Jurassic and mostly Cenozoic sediments of the Carpathian foredeep or partly even by overthrust of Outer Carpathian nappes, ultrabasic rocks are not too much known. More frequent occurrences are preferredly restricted to the Upper Morava dales where hidden bodies have been discovered by numerous hydrocarbon and other drillings. Bodies of a gabbro-peridotite complex occur near Vlkoš allways together with a set of secondary alterations (mainly amphibolization, chloritization and steatitization). In analogy, the Rusava ultrabasite (gabbro-norite) massif occurs along the Holešovice fault system in spatial proximity with teschenite occurrences (Dudek in Weiss et al., 1978). Rocks of the teschenite association represent, substantially, the continuation of both intrusive and effusive members of the metaophiolite complex.

A gravimetric low may be interpreted in the Vienna basin area caused by superposition of more shallow (15 to 25 km depth) and deeper (35 km) sources. In the area of Upper Morava dales, a body inducing negative disturbance of the gravity field is assumed having its upper boundary in 35 km depth and the centre of gravity about 45 km below the recent surface. The main source of the negative anomaly along the boundary of the Bohemian mass and West Carpathians is usually explained by the basalt layer and the relief of the Moho-discontinuity. These factors are multiplied by the influence of inhomogeneities in the basalt layer itself and, obviously, by interferences of light sedimentary masses in supracrustal portions.

Ultrabasics and related rocks are

confined, in the Brunnia mass, to the Brno massif and its crystalline envelope. The geotectonic position of the Brno massif in the area of strong Variscan tectogenesis together with its Assyntian age (Štelcl et al., 1978, Štelcl — Weiss, 1983) create entirely different conditions for the distribution of the metaophiolite complex.

Basite and ultrabasite bodies of the Brno massif are spatially confined to a metabasite zone running in belt-like shape, broad about 10 km and almost 50 km long, through the central part of the massif. The metabasite zone may be divided into two subzones (Mísař, 1980). The westernly metadiorite subzone is relatively thicker and is composed of even xenoliths, diorite, gabbro (even olivine-bearing) and ultrabasite in the crystalline envelope namely in the southern part of the Brno massif. The eastern part is created by discontinuous metadiabase subzone.

Ultrabasite bodies in the metabasite zone are less frequent (Moravany, Želešice, Bystrc, Kohoutovice, Milonice, Jinačovice and Kuřim localities). Probably, the entire metabasite belt creates an assymetric synform structure. Such arrangement results from interpretation of the gravity field in the northern part of the zone (Skácelová — Weiss, 1978). Obviously, the metabasite zone continues accross the Želešice magnetic hight to SE into the Carpathian foredeep.

Contrary to the ultrabasics, gabbroid rocks are not so strictly confined to the zonality of the metabasite zone though generally reveal also a N-S spatial distribution (Kamenný vrch, Podskalský mlýn and Kounice localities). Such distribution is well expressed by the appearance of the metabasite zone in geophysical data. In gravity maps, the zone creates a relatively broad belt of positive anomalies of NNE-SSW strike arching into NW—SE direction in its southern part. Such course is reflected by pronounced magnetic pattern (Šalanský et al., 1965) and converging also with the continuation of this abundantly differentiated belt southwards.

Conclusions

Evaluating the presence of basics and ultrabasics in the Moravian block from the viewpoint of synthetic geological approach and existing geophysical data, their immediate relation to tectogenesis and, namely, to the shape pattern of the basalt layer may be deduced. Geophysical data disclose their spatial distribution into the belts of tectonic predisposition and point to the possibility, assuming also the proximity of surficial manifestations along the periphery of the Lednice and Přibyslav deep-seated faults, that these ultrabasites have been transported into infracrustal or even supracrustal situations within the Moravian block. Hence, the prevailing close relation of basic and ultrabasic rocks to the basalt layer of the crust or even to the upper mantle becomes evident in the southwestern part of the Bohemian mass.

Several from the previous conclusions have the nature of working hypotheses as the Conrad-discontinuity occurs in about 20 km depths in this crustal area (fig. 1). In spite of its location in such considerable depth, data allow to deduce the characteristics of the crust and pose a set of problems to be solved in the future. In the case if some of previous conclusions are pertinent, possibilities arise to the knowledge of processes taking place within the Earth's crust since accumulations of mineral raw materials are immediately depending on the type of crust.

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REFERENCES

Adam, Z. — Beránek, B. — Weiss, J. 1976: Deep geophysical investigations contribution to the problem solution of the Carpathians with the Bohemian Massif. *Sbor. geotekt. konf. Smolenice, pp. 124—130.*

Beránek, B. 1978: Výzkum stavby zemské kůry na území ČSSR metodami explozívní seismologie a transformovaných tíhových polí. *[Doktorská dizertační práce], s. 1—250.*

Beránek, B. — Adam, Z. 1975: Některé výsledky výzkumu v oblasti styku Českého masivu a Karpat. *Sbor. geol. Věd, Ř. UG, 13, s. 65—74.*

Beránek, B. — Dudek, A. 1977: Charakternyje čerty stroenija kory v variskom orogene i alpidach s osobnym vnimanijem k izučeniju zon perechoda. *Carpatho-Balk. Geol. Assoc., Proc. of the 10th Congr. pp. 77—89.*

Beránek, B. — Dudek, A. — Suk, M. — Weiss, J. 1971: Geologická interpretace hlubinného seismického sondování v ČSR. *Geol. Průz., XII, 12, s. 353—357.*

Beránek, B. — Dudek, A. — Zounková, M. 1975: Rychlostní modely stavby zemské kůry v Českém masívu a Západních Karpatech. *Sbor. geol. Věd, Ř. UG, 13, s. 7—20.*

Beránek, B. — Suk, M. — Weiss, J. J. 1980: Geological sections through the Variscan orogene in the Bohemian Massif. *Sbor. geol. Věd, Geologie, 34, s. 7—29.*

Čuta, J. — Mísař, Z. — Válek, R. 1964: Interpretace tíhového pole severovýchodního okraje Českého masívu. *Sbor. geol. Věd, Ř. UG, 3, s. 157—180.*

Hess, H. H. 1955: Serpentines, orogeny and epeirogeny. *Geol. Soc. Amer. Spec. Pap., 62, pp. 391—407.*

Jaroš, J. — Mísař, Z. 1965: Problems of the contacts between the West Moravian crystalline complexes and Brno unit in the basement of the Boskovice Furrow (Moravia). *Krystalinikum, 3, s. 75—86.*

Jaroš, J. — Mísař, Z. 1967: Problém hlubinného zlomu Boskovické brázdy. *Sbor. geol. Věd, Ř. G, 12, s. 131—147.*

Jelínek, E. et al. 1978: Metaofiolity letovického krystalinika. *MS — Ústav geol. věd PFUK (Praha), díly A-K.*

Kropotkin, P. N. 1973: Dinamika zemnoj kory. Problemy global'noj tektoniky. *Akad. Nauk SSSR, Otd. Geol., geofiz. i geochim., s. 27—59.*

Meissner, R. 1967: Zum Aufbau der Erdkruste. Ergebnisse der Weitwinkelmessungen im bayerischen Molssebecken, Teil II. *Gerlands Beitr. Geoph., 76, S. 295—314.*

Mísař, Z. 1966: Výzkum ultrabazických těles v letovickém krystaliniku. *Zpr. geol. Výzk., 1964, 45.*

Mísař, Z. 1979: The Position of Ultrabasic Rocks in Geotectonic Cycles and Geological Units of the Bohemian Massif. *Geodynamic investigations, Czechoslovakia, pp. 167—178.*

Mísař, Z. 1980: Ultrabazika jako indikátory hlubinné, blokové a vrásové stavby na příkladě východního okraje Českého masívu. *Zbor. pred. konf. ve Smoleniciach 1979, s. 191—210.*

Mísař, Z. — Mottlová, L. — Suk, M. — Weiss, J. 1972: Interpretace tíhového pole moldanubika a přilehlých jednotek. *Sbor. geol. Věd, Ř. UG, sv. 10.*

Mojseenko, F. S. 1975: Sovremennye predstavlenija o zemnoj kore. *Vest. Leningr. Univ., Ser. Geol., Geograf., 24, 4, S. 5—16.*

Němec, F. 1935: O některých basických vyvřelinách západomor. krystalinika. *Sbor. Klubu přírodov. v Brně, 17, s. 105—121.*

Rosický, V. 1926: Gabbro od Železného u Tišnova a horniny je provázející. *Zvláštní otisk Sbor. Stát. Geol. Úst., VI, s. 401—426.*

Skácelová, D. — Weiss, J. 1978: Model hloubkového vývoje brněnského masívu podle geofyzikálních dat. *Čas. Mineral. Geol., 23, 4, s. 409—416.*

Šalanský, K. 1972: Některé výsledky podrobného aerogeofyzikálního měření (1 : 25 000) v území mezi Brnem a Žďárem n. S. *Sbor. geol. Věd, Ř. UG, 10, s. 63—73.*

Šalanský, K. et al. 1967: Interpretace geofyzikálních map 1 : 200 000 aeromagnetometrie. Moldanubikum a sousední geologické jednotky. *MS — archív Geofyzika n. p., ÚGF Praha 29.*

Štelcl, J. et al. 1978: Základní petrologické zhodnocení brněnského masívu a jeho petrogenetických vztahů ke krystaliniku v podloží karpatské předhlubně. MS — UJEP Brno. *Zpráva za úkol II-4-2/3, díl I a II, s. 1—482.*

Štelcl, J. — Weiss, J. 1983: Nekotoryje rezultaty izučenija Brunnii s točki zrenija poznanija jugo-vostočnoj okrainy central-no-evropejskoj epivariskoj platformy. *Scripta Fac. Sci. Nat. Univ. Purk. Brunn., Geologie, 13, 2.*

Weiss, J. 1957: Petrografie basických hornin západně od Olešnice na Moravě. *Sbor. Ústř. Úst. geol., odd. geol. XXIII, 1, s. s. 29—60.*

Weiss, J. 1971: Gabra západomoravského krystalinika. *Folia přírodověd. Fak. UJEP v Brně, Geol. 12, 6, s. 93—102.*

Weiss, J. 1971: Ultrabazická tělėsa u Dalešic. *Sbor. Ultrabaz. ultramaf. 1966—1970, s. 94—96.*

Weiss, J. 1975: Geologická pozice ofiolitů v zemské kůře. *Script. přírodověd. Fak.*

UJEP v Brně, Geol. 1, 5, s. 43—52.
Weiss, J. 1977: Fundament moravského bloku ve stavbě evropské platformy. *Folia UJEP, Geologia, 18, 13, s. 1—65.*
Weiss, J. et al. 1978: Ofiolity moravského bloku a model jeho hlubší stavby. *MS — UJEP Brno, s. 1—179.*
Wyllie, P. J. 1967: Ultramafic and related rocks. *Naklad. J. Wiley and Sons, pp. 1—464.*
Zeman, J. 1974: The new tectonic map of the Bohemian Massif — some problems of its concept. *Sbor. geol. Věd, Geologie, 26, pp. 35—44.*
Zeman, J. 1975: K problému dynamické funkce bazaltové vrstvy v kůře Českého masívu. *Sbor. ref. Výzkum hlubinné stavby Československa (Loučná), s. 101—106.*
Zoubek, V. — Vyskočil, V. 1971: Anomální tíhové pole ve vztahu ke geologickým strukturám v oblasti střední Evropy. *In: Výzkum hlubinné stavby Československa, Loučná 1971, Ústav užité geofyziky 1972, s. 97—131.*

Intrakrustální projevy bazaltového patra ve vývoji moravského bloku

JAROSLAV WEISS

Posuzujeme-li možnosti existence bazitů a ultrabazitů v prostoru moravského bloku z hlediska geologické syntézy a dosavadních geofyzikálních výsledků, zjišťujeme jejich přímý vztah k tektogenezi a zejména tvarové analýze bazaltového patra. I z geofyzikálních materiálů je prostorové rozmístění na zónách tektonické predispozice zřejmé a naznačuje možnosti — bereme-li v úvahu těsnou blízkost povrchových projevů periférie lednického a přibyslavského hlubinného zlomu — transportu těchto ultrabazitů do infrakrustálních, popřípadě až suprakrustálních částí zemské kůry moravského bloku. Je tedy evidentní, že bazické až ultrabazické horniny jihovýchodní části Českého masívu mají převážně úzký vztah k bazaltovému patru, případně svrchnímu plášti.

Mnohé z uvedených závěrů mají charakter pracovní hypotézy, poněvadž, jak vyplývá ze základního obrázku č. 1, se Conradova hranice pohybuje v této části zemské kůry průměrně okolo — 20 km. I když je tato úroveň poměrně ve velkých hloubkách, přesto si můžeme jednak vytvořit určitý obraz o geologickém charakteru zemské kůry, jednak před nás předstupuje celá řada otázek, které je nutno v budoucnu řešit. V případě, že některé závěry ve výše uvedeném textu jsou správné, otevírají se nám možnosti poznání charakteru procesů probíhajících v zemské kůře, poněvadž na jejím typu je přímo závislá přítomnost kumulací rudních i nerudních ložisek.