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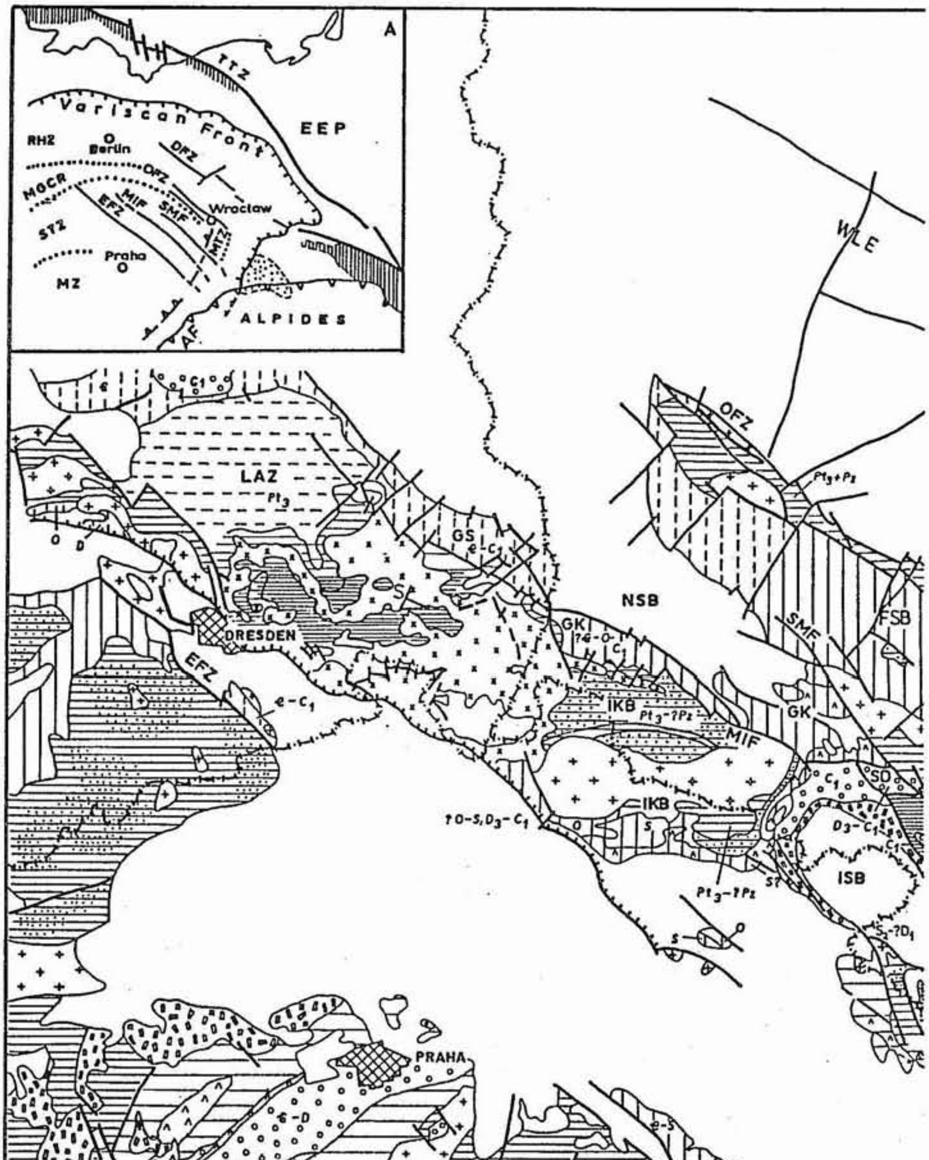
Andrzej ŻELAŹNIEWICZ, Stefan CWOJDZIŃSKI

Deep crustal structure of southwestern Poland and a proposal of two reflection seismic profiles

The paper summarizes recently available geological and geophysical data from southwestern Poland, and especially from the Sudetes, in order to propose that at least two new seismic reflection profiles be run in this region. The new transects are aimed at (1) the 3-D recognition of the Variscan crustal structures in the NE part of the Bohemian Massif and (2) relating them to those already established further to the west and southwest, in central Europe.

INTRODUCTION

The Paleozoic platform in Poland, located between the Precambrian East-European Platform (EEP) to the NE and the Bohemian Massif to the SW (Fig. 1), is extensively covered with Mesozoic and Cenozoic deposits, hence known only from subsurface data collected while prospecting for oil and gas in Permian rocks. Unfortunately, of the great number of boreholes, usually terminating immediately below the Permian base, relatively few provide good information about the pre-Permian basement. Most of the existing geophysical data was generated for well logging purposes, thus without considering deeper crustal levels. Apart from a regional gravimetric and magnetic survey, providing fairly comprehensive yet shallow information, the Paleozoic platform and crystalline areas of the northern Bohemian Massif in southwestern Poland and northern Czech Republic, are almost devoid of systematic studies of their crust by deep seismic soundings. The only exception so far is the VII th international profile cutting across the discussed region in a SW–NE direction (Fig. 7). Since this region contains not only hidden Caledonian and Variscan structures, with poorly known Cadomian basement, but possibly also a suture zone between Baltica and Gondwana-derived microplates or terranes, it becomes of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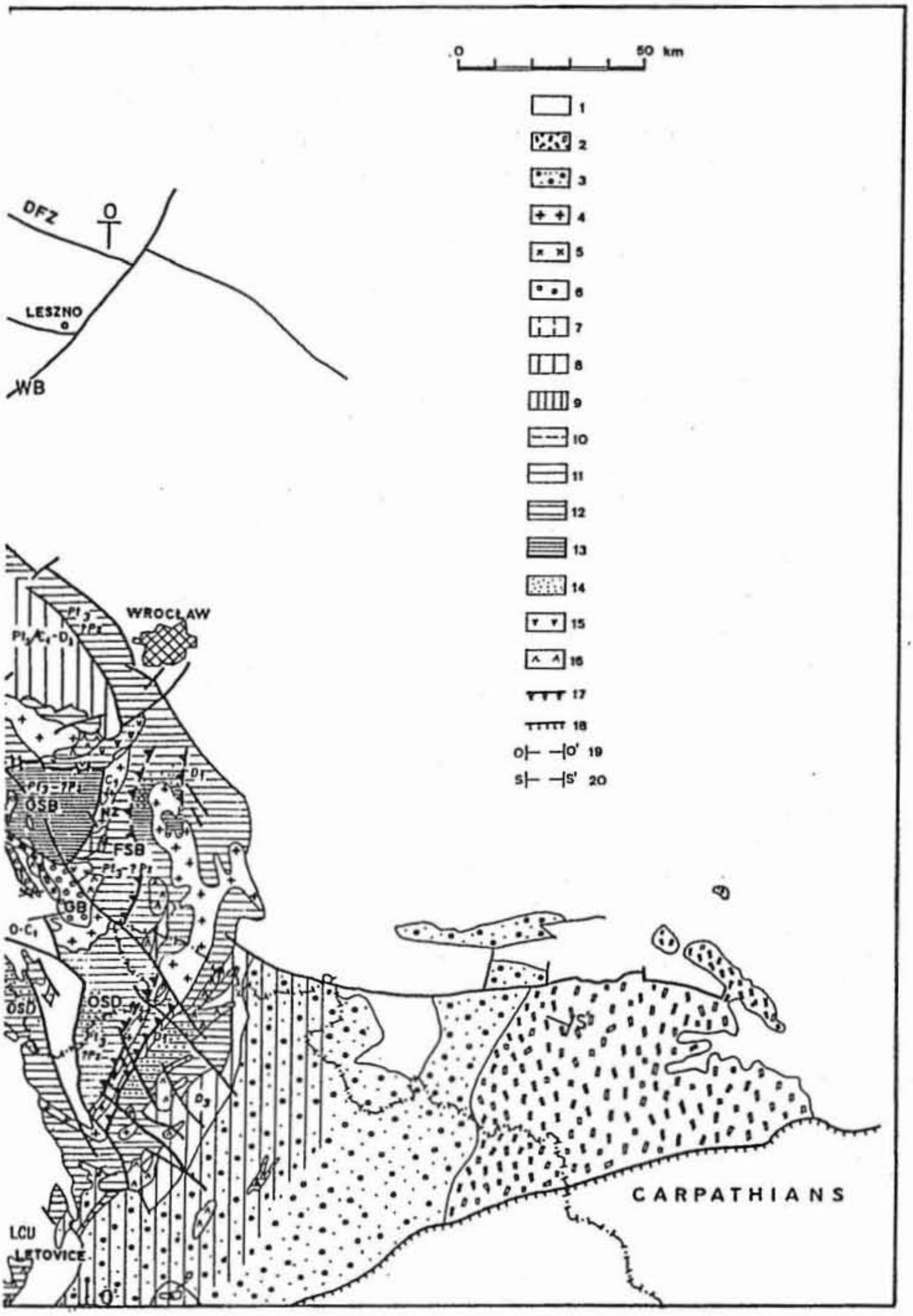
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paramount importance for the regional geology to obtain more knowledge about the deep crust there. This needs some new seismic experiments. Therefore, this paper proposes the running of two reflection seismic profiles, normal (ODEL) and parallel (SUDET) to the regional (Sudetic) grain, and provides up-to-date geological constraints as well as a summary of all regional geophysical work done so far in SW Poland. This may also act as a comprehensive basis for some other, possibly differently oriented profiles. The geophysical experiments which have currently been performed in Poland, are confined to the Teisseyre-Tornquist Zone, being aimed at the recognition of its details in longitudinal and transversal sections. For financial reasons other targets in Poland can receive at the moment less significant assistance and probably only the GB-2 profile will have been

Fig. 1. Geological sketch of the area of the proposed ODEL and SUDET transects; A — location in Central Europe

1 — Permo-Mesozoic cover; 2 — Upper Carboniferous molasse; 3 — Lower Carboniferous flysch; 4 — Variscan granitoids; 5 — pre-Variscan granitoids; Paleozoic sequences (Є —Cambrian, $Є_1$ — Lower Cambrian, O — Ordovician, S — Silurian, S_2 — Upper Silurian, D — Devonian, D_1 — Lower Devonian, D_3 — Upper Devonian, C_1 — Lower Carboniferous): 6 — unmetamorphosed, 7–9 — grade metamorphic rocks: 7 — very low, 8 — low, 9 — medium; Upper Proterozoic–Paleozoic (Pt_3–Pz) sequences, grade metamorphic rocks: 10 — very low, 11 — low, 12 — medium, 13 — high; 14 — orthogneisses; 15 — serpentinites (ophiolites); 16 — metabasites; 17 — Variscan thrusts; 18 — Alpine thrusts; 19 — transect ODEL; 20 — transect SUDET; g e o l o g i c a l u n i t s : EEP — East-European Platform, MGCR — Mid-German Crystalline Rise, STZ — Saxothuringian Zone, RHZ — Rhenohercynian Zone, MZ — Moldanubian Zone, MTZ — Moldanubian Thrust Zone, TTZ — Teisseyre-Tornquist Zone, WB — Wielkopolska Block, FSB — Fore-Sudetic Block, GSB — Góry Sowie Block, NSB — Northern Sudetic Depression, ISB — Intra-Sudetic Depression, NZ — Niemcza Zone, LAZ — Lusatian Anticlinorium, GS — Görlitzer Schiefergebirge, GK — Góry Kaczawskie Mts., IKB — Izera-Karkonosze Block, OSD — Orlica-Śnieżnik Dome, LCU — Letovice crystalline unit, WLE — Wolsztyn — Leszno Elevation, SD — Świebodzice Depression, GB — Góry Bardzkie Mts.; m a j o r f a u l t z o n e s : AF — Alpine Front, DFZ — Dolsk Fault Zone, OFZ — Odra Fault Zone, SMF — Sudetic Marginal Fault, MIF — Main Intra-Sudetic Fault, EFZ — Elbe Fault Zone; Fig. A: stippled — Upper Silesia Massif under overstep sequences; vertical lines — areas of Early Paleozoic (Caledonian) deformation

Szkic geologiczny obszaru transektów ODEL i SUDET; A — położenie w Europie

1 — pokrywa permo-mezozoiczna; 2 — molasa górnokarbońska; 3 — flisz dolnokarboński; 4 — granitoidy waryscyjskie; 5 — granitoidy pre-waryscyjskie; sekwencje paleozoiczne (Є — kambr, $Є_1$ — kambr dolny, O — ordowik, S — sylur, D — dewon, D_1 — dewon dolny, D_3 — dewon górny, C_1 — karbon dolny): 6 — niemetamorficzne, 7 — bardzo niskiego stopnia metamorfizmu, 8 — niskiego stopnia metamorfizmu, 9 — średniego stopnia metamorfizmu; sekwencje górnoproterozoiczno-paleozoiczne (Pt_3–Pz): 10 — bardzo niskiego stopnia metamorfizmu, 11 — niskiego stopnia metamorfizmu, 12 — średniego stopnia metamorfizmu, 13 — wysokiego stopnia metamorfizmu; 14 — ortognejsy; 15 — serpentynity (ofiolitowe); 16 — metabazyty; 17 — nasunięcia waryscyjskie; 18 — nasunięcia alpejskie; 19 — linia transektu ODEL; 20 linia transektu SUDET; j e d n o s t k i g e o l o g i c z n e : EEP — platforma wschodnioeuropejska, MGCR — krystaliczne wyniesienie środkowoniemieckie, STZ — strefa saksoturyngska, RHZ — strefa renohercyńska, MZ — strefa moldanubska, MTZ — strefa nasunięć moldanubskich, TTZ — strefa Teisseyre'a-Tornquista, WB — blok wielkopolski, FSB — blok przedsudecki, GSB — blok Gór Sowich, NSB — depresja północnosudecka, ISB — depresja śródsudecka, NZ — strefa Niemczy, LAZ — antyklinorium Łużyc, GS — Zgorzeleckie Góry Łupkowe, GK — Góry Kaczawskie, IKB — blok izersko-karkonoski, OSD — kopuła orlicko-śnieżnicka, LCU — jednostka krystaliczna Letovic, WLE — elewacja Wolsztyna — Leszna, SD — depresja Świebodzic, GB — Góry Bardzkie; g ł ó w n e d y s l o k a c j e : AF — front Alpidów, DFZ — strefa uskokowa Dolska, OFZ — strefa uskokowa Odry, SMF — sudecki uskok brzeżny, MIF — główny uskok śródsudecki, EFZ — strefa uskokowa Łaby; fig. A: kropkowanie — masyw górnośląski pod pokrywą osadową; kreski pionowe — obszary deformacji wczesnopaleozoicznych (kaledońskich)

continued in 1994 from Leszno toward the Sudetes. However, the execution of a comprehensive deep vertical reflection survey in southwestern Poland is also highly in demand.

GEOLOGICAL SETTING

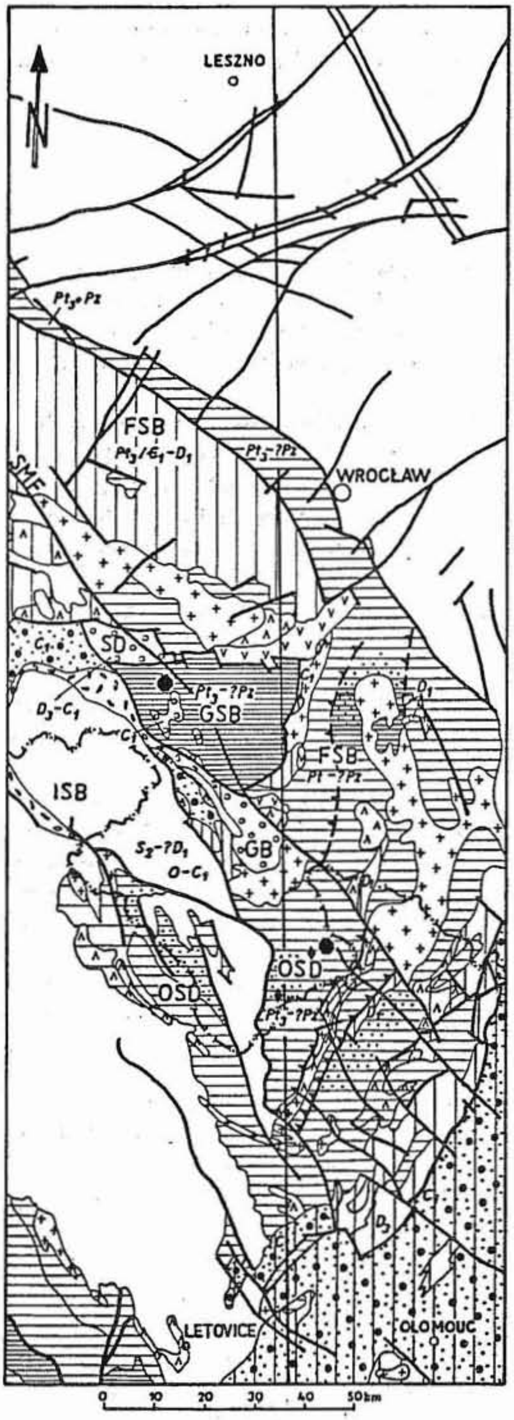
The region to be transected by the ODEL and SUDET profiles (Fig. 1) consists of several crustal blocks, otherwise internally composed of structural-stratigraphic mosaic. The blocks are bounded by major subvertical fault zones (Figs. 2–5), activated during early through to Late Carboniferous times, but later repeatedly reactivated up to the Recent.

Their pre-Permian kinematic history must have included an important normal faulting component, which produced synsedimentary horst and grabens in a crystalline basement, unevenly filled up with Visean through to Namurian flysch and Westphalian molasse. The Late Permian peneplain smoothed both the basement horsts and folded flysch-molasse successions. Further platform-type sedimentation in Permo-Mesozoic times went on in a basin sagging asymmetrically towards the EEP margin during infilling.

In the area of the ODEL and SUDET transects, the crystalline basement, of largely unknown age (Cadomian? Caledonian?), is extensively hidden beneath the overstep sequences of Hercynian and Alpine ages (Figs. 1–5). It is relatively well exposed only in the Sudetes (and farther south in the Bohemian Massif) from where most of our knowledge of it comes. This, however, cannot be safely extrapolated northeastwards. Hence, the need for a reflection seismic survey in the area is obvious.

The stratigraphic-structural domains, constituting the NE part of the Bohemian Massif, apparently belong to four successions. These are: (1) Proterozoic–Lower Cambrian(?), (2) Cambrian(?), Ordovician(?)–Silurian, Lower Devonian(?), (3) Cambrian(?), Ordovician–Lower Carboniferous, and (4) Lower Devonian, Upper Devonian–Lower Carboniferous/Upper Carboniferous (Figs. 1, 2, 4). It remains unclear, hence speculative, whether there have been depositional interconnections between those successions, or they represent separate basins, possibly at a large distance from one another during infilling. An up-to-date summary of our knowledge of stratigraphy in SW Poland was recently given by Z. Urbanek et al. (1994). So far, a tectonothermal event has been fairly well constrained in the Ordovician, manifested by intraplate rifting and bimodal volcanism, along with extensive granitoid plutonism, and metamorphism up to amphibolite facies likely due to an overall extension related to the early development of the Saxothuringian basin (W. Franke et al., 1993). The terminations of the mentioned successions apparently reflect the Cadomian ($Є_1$), Caledonian (S/D_1) and Variscan (C_1/C_2) tectonic inversions. Therefore, one can speak on the one hand about a collage (or a reworked collage) of crustal elements of different age, once derived from the northern Gondwana margin, or on the other about on essentially continuous story of an extension and thinning of the Cadomian, or earlier, crust and then its gradual shortening and thickening.

In either case we deal with structural products of the Paleozoic accretion, although they have been set in a jig-saw puzzle mode, mainly due to the Late Devonian–Early Carboniferous/Late Carboniferous interplay of wrenching and normal faulting in NW-



trending zones, combined with occasional thrusting. The data now available about the structure of the West Sudetes (Lugicum) region was recently summarized by A. Żelaźniewicz et al. (1994). The structures can be identified on the map and cross sections (Figs. 1–5) along the proposed ODEL and SUDET transects which should help visualization of them as crustal features.

GEOLOGY ALONG THE PROFILES

THE ODEL

The ODEL profile is to start near the southern termination of the GB-2 transect, where older rocks are uncomformably overlain by Permo-Mesozoic overstep sequences (Figs. 2, 3). Near Leszno, below the Permian cover, a number of boreholes have encountered metamorphic basement rocks emerging from beneath the Lower Carboniferous flysch strata in a fault-bounded block 70 km long and 25 km wide, referred to as the Wolsztyn — Leszno Elevation (WLE) — K. Wierzchowska-Kicułowa (1984, 1987). It is built mostly of Lower Paleozoic(?) quartz-sericite schists (Fig. 3), which also continue farther to the NW (near Międzyrzecz) and to the SE (near Krotoszyn).

South of the Wolsztyn — Leszno Elevation, under the Permo-Triassic

Fig. 2. Geological sketch along the ODEL transect

Rhombs — eclogites; hexagons — granulites; other explanations as in Fig. 1

Szkic geologiczny wzdłuż transektu ODEL

Romby — eklogity; sześcioboki — granulity; pozostałe objaśnienia jak na fig. 1

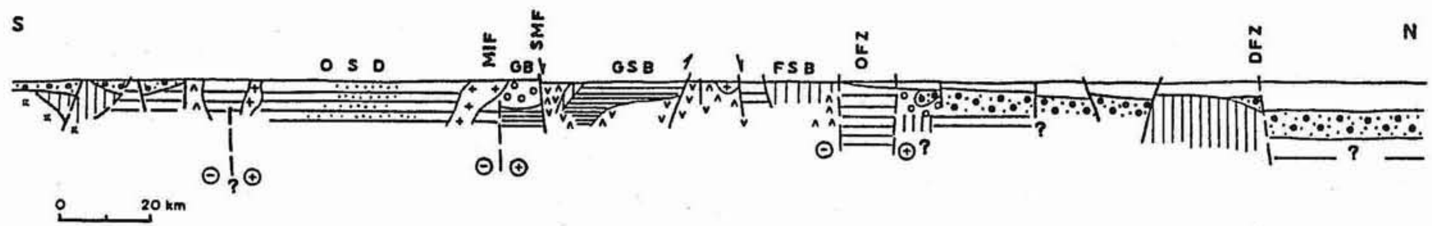


Fig. 3. Geological cross-section along the ODEL

Explanations as in Fig. 1

Przekrój geologiczny wzdłuż transektu ODEL

Objaśnienia jak na fig. 1

strata forming the Fore-Sudetic Monocline, the subsurface data reveals a folded succession of Lower Carboniferous (to Namurian) flysch and underlying it, also unmetamorphosed, Devonian. This succession occurs in a fault-bounded block and has a fault contact with another basement block several kilometers wide, built of gneisses, schists, amphibolites and granitoids, referred to as the Odra metamorphic unit and considered as a continuation of the Mid-German Crystalline Rise (Figs. 1, 3) — A. Grocholski (1987). The Odra metamorphic unit is bordered to the NE and SW by the Northern Odra Fault (NOF) and Southern Odra Fault (SOF) and thus coincides with the Odra Fault Zone (OFZ), with brittle faults particularly prominent in the cover. The rocks of the Odra metamorphic unit are mostly subvertically disposed and often bear evidence of ductile shear deformation. Therefore, the OFZ block is considered to have accomodated wrench displacement in the Late Carboniferous and Permian (sense of motion remains undetermined).

The movement on the southern boundary (SOF) of the OFZ controlled the deposition of the Permo-Triassic sequence, which is present NE of it in the form of the Fore-Sudetic Monocline, and absent SW of it (Figs. 1, 3). SW of the OFZ there are basement rocks exposed at the pre-Tertiary surface, referred to as the Fore-Sudetic Block (FSB).

The FSB consists of medium- to high-grade gneisses, mica schists and amphibolites, accompanied by augen orthogneisses as well as low-grade phyllites, greenstones, serpentinites and gabbros. Their biostratigraphic age signature ranges from Precambrian to Early Carboniferous, all being pierced by Variscan granitoids (Z. Urbanek et al., 1994). Because of a vast Tertiary cover neither stratigraphic column, nor tectonic relationships of various lithological elements can safely be established. Nevertheless, most of these elements closely resemble related rocks known from the Sudetes area, which is separated from the Fore-Sudetic region by the Sudetic Marginal Fault (SMF). For example the Cambrian?, Ordovician–Lower Carboniferous Góry Kaczawskie succession continues across the SMF to the FSB. Also the Sudetic ophiolite assemblage appears on either side of the SMF.

The ophiolite, much incomplete because it consists almost exclusively of unfoliated yet statically metamorphosed basic and ultrabasic rocks, is directly associated with the Góry Sowie gneiss block (GSB), part of which belongs to the FSB and part to the Sudetes (Figs. 1–3). Its isotopic age signatures vary from ca. 420 (U-Pb zircon; G. J. H. Oliver et al., 1993) to ca. 350 Ma (Sm-Nd isochrone; C. Pin et al., 1988), but on the stratigraphic evidence it cannot be younger than Late Devonian. The immediate contacts of the GSB with the ophiolite are poorly exposed. However, it is evident that they are not ductile but dominantly cold and brittle of normal fault type, both high and low-angle ones, and obviously related to the late uplift of both domains. On the other hand, it appears from the gravimetric and magnetic survey that the western part of GSB is accompanied by gravity and magnetic lows, while northeastern and southern parts show relative highs, suggesting that the eastern part of GSB is at least partly underlain by heavy ophiolitic rocks (Fig. 5).

The GSB gneisses and migmatites, likely of Riphean–Early Cambrian protolith age, had zircon ages between 490–380 Ma, and were exposed at the surface, together with the ophiolite, by the Late Devonian (A. Żelaźniewicz, 1987, 1990). A high-angle reverse fault scarp of the GSB fed, in the Visean, the autochthonous part of the adjacent Góry Bardzkie complex which also includes an allochthonous part consisting of an unmetamorphosed

Ordovician–Lower Carboniferous succession, redeposited into the Early Carboniferous flysch.

Next on the ODEL transect is a Variscan granitoid massif (Kłodzko — Złoty Stok), derived from a mixed magma of calc-alkaline geochemical signature and possibly of an Andean-type emplacement (M. W. Lorenc, 1991), and producing wide hornfelsic halo in the rocks of the Góry Bardzkie complex (Figs. 2, 3).

Farther south the ODEL enters the Orlica-Śnieżnik Dome (OSD) that consists of a complex, mostly orthogneissic core of 500–335 Ma isotopic ages, and surrounding mantle of medium- and low-grade metamorphic rocks. The core includes HP eclogites and granulites of ca. 350–330 Sm-Nd age (H. K. Brueckner et al., 1991). Nevertheless their position as well as their age still remain unclear. The tectonics of the whole OSD were dominated by its location next to the Moravo-Silesian Block, with earlier N-trending and E-verging structures being overprinted by mostly N/NE-verging structures, developed due to dextral transpression and rapid uplift under the greenschist facies conditions at the Lugian (Moldanubian *s.l.*)/Moravian boundary in the Visean. The OSD in its southern part is cut by unfoliated granitoids (Figs. 1–3), separating, together with the poorly known Bušin Fault the N-trending and W-trending structures in the dome. To the west, the North Bohemian Cretaceous occurs, with the SE prolongation of the Elbe Fracture Zone (EFZ) hidden underneath

The ODEL is to terminate at the Lower Carboniferous flysch strata here, most likely overlying the Cadomian granitoids of the Brno Massif. This is ca. 10 km east of the Letovice crystalline unit (LCU) that consists of mid-grade amphibolite, mica schists, gneisses and metavolcanogenic rocks. The amphibolites are considered as a dismembered ophiolite complex, which, together with the associated rocks, shows a pronounced NW-trending grain made by coaxial polyphase folds and lineations. Further to the south there is a stack of Moravian and Moldanubian nappes in the Svratka Dome, recently explained by northward thrusting during the Visean.

THE SUDET

The SUDET is going to be run (Figs. 1, 4, 5) from the northwest through the unfoliated Late Proterozoic Lausitz granodiorites of 600–550 Ma age, with patches of associated anatexites. Further east along the transect appear ca. 500–460 Ma old granites merging with the latter plutonites, and metasedimentary rocks of the Izera-Karkonosze Block (IKB). The granites zonally turn into orthogneisses, with deformation increasing eastward. This likely coincided with the extension of the Cadomian basement and consequent basin development, associated with the Ordovician intrusions of synorogenic granites and concurrent, possibly rift-related metamorphism.

Immediately east of the Ordovician metagranitoids the transect meets unfoliated Variscan granite (Karkonosze) of ca. 330 Ma Rb-Sr age (M. P. Mierzejewski, T. Oberc-Dziedzic, 1990), which exerted a well pronounced thermal influence on the country rocks.

The next unit on the transect is the eastern flank of the Izera-Karkonosze Block (IKB), which consists of subvertically disposed, N/NE-trending orthogneisses, mica schists and bimodal volcanic rocks again with some isotopic hints of Ordovician age, affected by undated, yet pre-Carboniferous, greenschist metamorphism overprinting blue amphibole relics of earlier blueschist metamorphism. This complex underwent remarkable ductile-

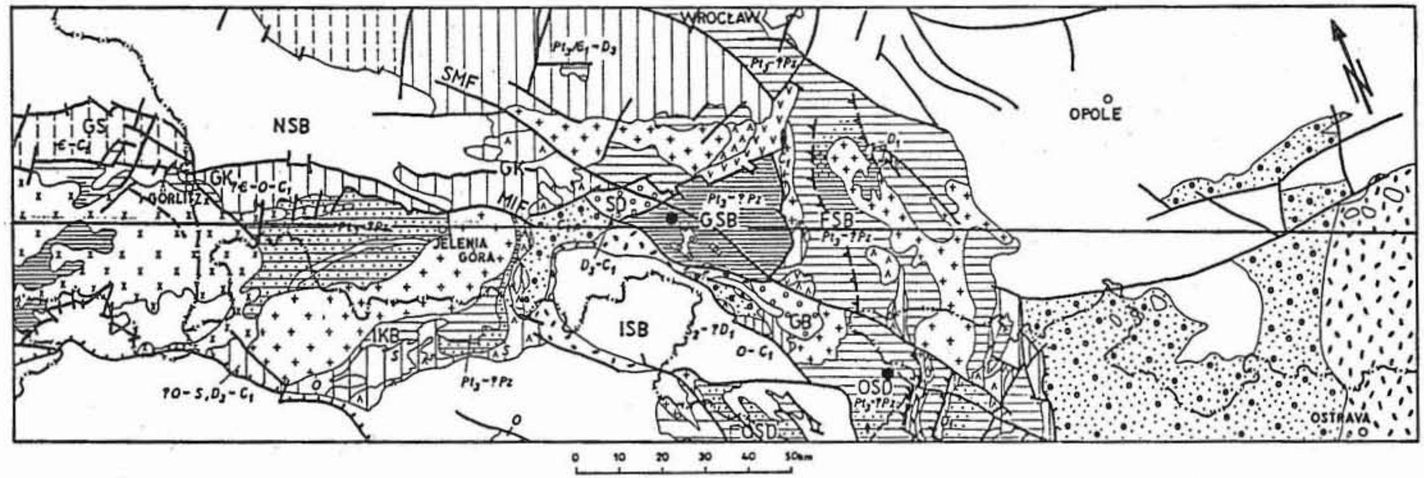


Fig. 4. Geological sketch along the SUDET transect
Explanations as in Figs. 1, 2
Szkic geologiczny wzdłuż transektu SUDET
Objaśnienia jak na fig. 1 i 2

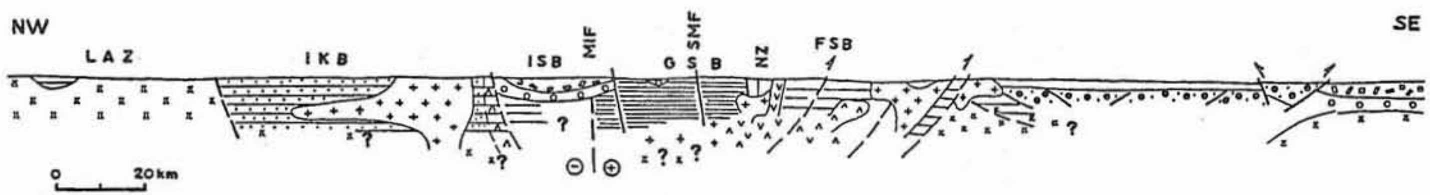


Fig. 5. Geological cross-section along the SUDET
Explanations as in Fig. 1
Przekrój geologiczny wzdłuż transektu SUDET
Objaśnienia jak na fig. 1

-to-brittle downfaulting to the E, connected with the Tournaisian onset of the Intra-Sudetic Depression (more than 6–8 km thick clastics). The basement of this depression is unknown, but it obviously must accomodate the boundary between the IKB and gneiss-migmatite complex of the Góry Sowie Block (GSB), which occurs further to the east along the SUDET transect.

The high-grade rocks of GSB, bearing various isotopic signatures of 480 to 370 Ma (O. van Breemen et al., 1988), vere undoubtedly at the surface by the Late Devonian–Tournaisian and shedded clasts to adjacent (pull-apart?) depressions located north and south of it (S. J. Porębski, 1990; J. Haydukiewicz, 1990). Also north and south of the GSB occur ophiolitic rocks that are to be transected by ODEL (Figs. 2, 3). Eastward continuation of the SUDET beyond the GSB, meets a complex zone of low sheared metagraywacke and metaquartzite, generally massive antigorite-tremolite serpentinites, mica schists and amphibolites, all being syntectonically intruded by hornblende granodiorite of 340 Ma age (various methods including Pb-Pb, Ar-Ar). Serpentinite might represent another fragment of obducted oceanic crust, but relevant kinematics can hardly be constrained. This complex zone has been referred to as the Niemcza Zone (NZ in Fig. 5) and put as a boundary between Moldanubian *sensu lato* and Moravo-Silesian Blocks. However, much more strongly mylonitized rocks appear further east, in the Strzelin area, which is therefore a far better candidate for the northern continuation of the Moldanubian thrust zone (Figs. 1, 4, 5). Both areas are to be cut by the SUDET, which then enters the Upper Devonian–Lower Carboniferous Variscan flysch known, however, in that section only from boreholes that have not drilled through it. Beyond the eastern margin of the flysch basin, subsurface data points again to the presence of Precambrian gneisses and granitoids of the Upper Silesian Block, which most likely continues to the SSE into the Cadomian Brunnia (Bruno-Vistulicum of A. Dudek, 1980), strongly reworked during Hercynian times. This basement massif is overlain by Lower Cambrian and then Devonian–Lower Carboniferous rocks followed by an extensive Upper Carboniferous coal-bearing molasse. The SUDET transect is to terminate here.

GEOPHYSICAL SETTING

Accordingly, the region under consideration is composed of several crustal blocks of different thickness and structure. Any interpretation of the deep structure based upon both surface and subsurface geological data available from the Sudetes, Fore-Sudetic Block, and Fore-Sudetic Monocline, where more then 250 boreholes reached the pre-Permian basement, has to take into account the results of geophysical investigations including quite abundant regional gravimetric (C. Królikowski, A. Grobelny, 1991) and magnetic data, but very scarce reflection and even refraction seismic survey (A. Guterch et al., 1975).

SEISMIC RECORDS

The seismic survey (deep seismic soundings and refraction profiles) in the region has supplied relatively good information about the Permo-Mesozoic sedimentary cover, but

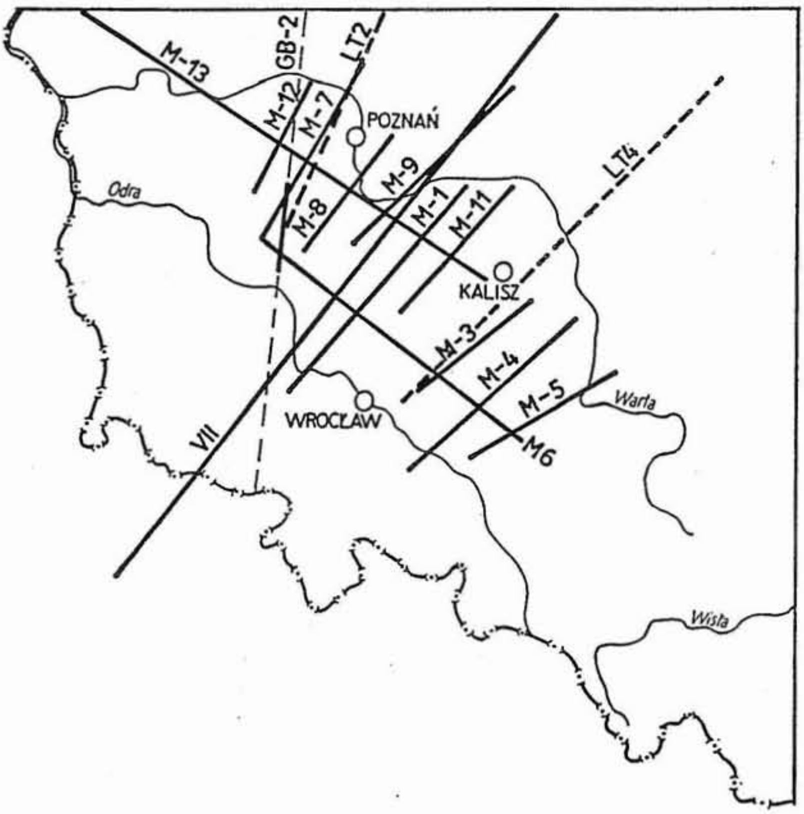


Fig. 6. Localization of main seismic profiles in SW Poland
Lokalizacja głównych profili sejsmicznych w Polsce południowo-zachodniej

resolution of the pre-Permian basement is very poor. The few DSS profiles shot so far were confined merely to the Fore-Sudetic Monocline (LT2, LT4, M-7 to M-13 in Fig. 6), with the exception of the VIIth international profile (EU-3) completed in the 70's, trending in a NE–SW direction and, cutting across most of the block structures and the NW–SE fault zones characteristic of the region (Fig. 7).

Additionally 13 refraction profiles (M-1–M-13), with a total length of 1500 km, have been performed over the area of the Fore-Sudetic Monocline, which provided information about both diversification of the sedimentary cover and seismic boundaries in the crystalline basement. Eleven NE–SW oriented profiles transect the monocline perpendicularly, and two of them (M6, M-13) are parallel to its strike, running in a NW–SE direction (Figs. 6, 9).

The results of these investigations were published by A. Guterch et al. (1975, 1986, 1991) — Fig. 7. The first geological interpretation of the VIIth profile was elaborated by

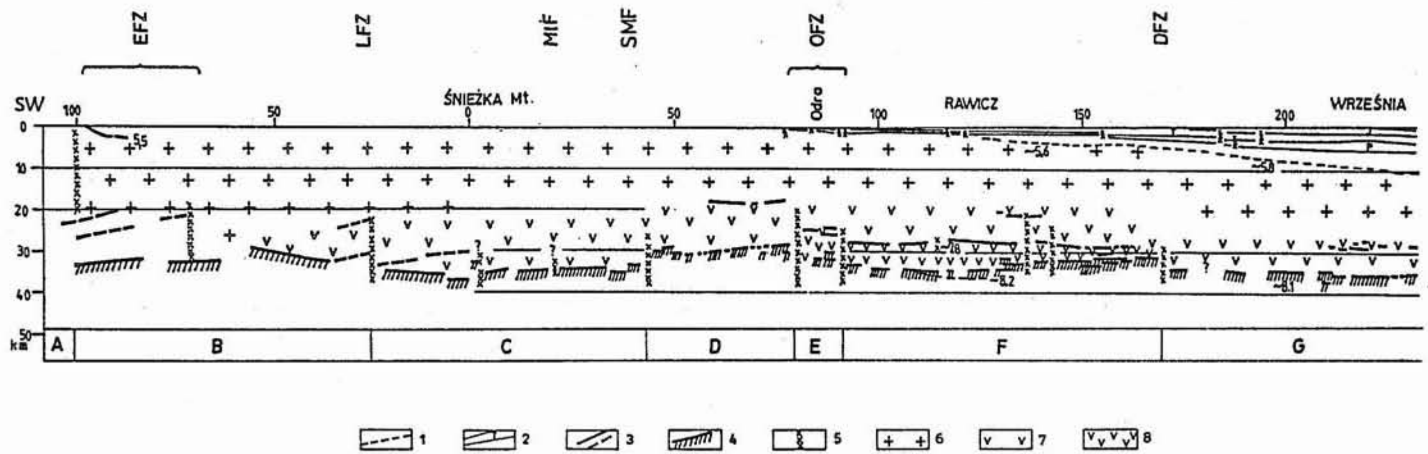


Fig. 7. Crustal structure along the VIIth international profile (EU-3) between the Elbe Fault Zone and the Dolsk Fault Zone (after A. Guterch et al., 1975; B. Beranek, A. Zatopek, 1981)

1 — boundary of consolidated basement; 2 — stratigraphic boundaries in platform cover; 3 — seismic boundaries in consolidated crust; 4 — Moho boundary; 5 — deep fractures; 6 — granite-gneiss layer (upper part of the crust); 7 — lower part of the crust; 8 — crust upper mantle transition zone; LFZ — Lusatian Fault Zone; crustal blocks: A — Tepla-Barrandien Block, B — Elbe Block, C — Sudetic Block, D — Fore-Sudetic Block, E — Odra Block, F — Wielkopolska Block, G — Września Block; other explanations as in Fig. 1

Struktura skorupy ziemskiej wzdłuż VII profilu międzynarodowego (EU-3) między strefą uskokową Łaby a strefą uskokową Dolska (według A. Gutercha i in., 1975; B. Beranka, A. Zatopka, 1981)

1 — granica podłoża skonsolidowanego; 2 — granice stratygraficzne w pokrywie platformowej; 3 — granice sejsmiczne w skorupie skonsolidowanej; 4 — granica Moho; 5 — rozłamy wgłębne; 6 — warstwa granitowo-gnejsowa (górna część skorupy); 7 — dolna skorupa; 8 — strefa przejściowa skorupy i górnego płaszcza; LFZ — strefa uskokowa Łużyc; bloki skorupy: A — Tepla-Barrandien, B — Łaby, C — Sudetów, D — przedsudecki, E — Odry, F — wielkopolski, G — Wrześni; pozostałe objaśnienia jak na fig. 1

W. Pożaryski (1975) — Fig. 8, and alternative geological cross-sections along this profile have recently been provided by S. Cwojdziński (1992) — Fig. 10A, B.

In 1985 a new project of deep seismic research was prepared by Państwowy Instytut Geologiczny (Polish Geological Institute, Warsaw). This project includes the GB-2 profile planned to cross both the FSM, FSB and the Sudetes along the line joining Leszno and Wałbrzych (Fig. 6). It has already been started and the first seismic near vertical reflection surveys with recordings up to 18 s TWT were realized in the Fore-Sudetic Monocline near Leszno.

The recognition of deep crustal elements for the Sudetes and Fore-Sudetic Block is much poorer than for the Fore-Sudetic Monocline area. Nevertheless, the main elements of the consolidated basement in this region, some major discontinuities and breaks in the lower crust and in the Moho have been established. These geophysically determined blocks are referred to as: (1) the Wielkopolska Block (WB) in the north, (2) the Odra Block bounded by the Northern Odra Fault (NOF) and Southern Odra Fault (SOF), respectively (Figs. 7, 8), (3) the Fore-Sudetic Block (FSB) separated from (4) the Sudetic Block by the Sudetic Marginal Fault, (5) the Elbe Block bounded by the Lusatian Fault Zone (LFZ) in the northeast and the Elbe Fault Zone (EFZ) in the southwest (Fig. 7).

Main information about thickness and internal structure of the crust in the area of ODEL and SUDET transect, supplied by the seismic method, is as follows:

1. The crust in the studied region supposedly forms a mosaic pattern of crustal blocks with different thicknesses (Figs. 7, 9, 10).

2. The region is cut by six major NW-trending fracture zones, mostly rooted at least at a depth of 30 km, yet their root zones remain unclear.

3. The northern block (WB) is considered as the eastern continuation of the Rhenohercynian Zone, characterized here by crustal thickness varying from 28 to 30 km (Fig. 7). Typical lower crust is underlain here by a 3–6 km thick lensoidal transition zone between lower crust and upper mantle (V_p = 7.5–7.8 km/s) discovered by A. Guterch et al. (1975). Under platform sequences occur as (1) folded and foliated (cleaved) sedimentary rocks of Late Devonian–Early Carboniferous age, several hundreds up to several thousands of meters thick, and (2) low-grade metamorphic basement found in boreholes between Krotoszyn and Międzyrzecz (Wolsztyn — Leszno Elevation). A deeper basement is unknown, and the seismic record here gives only very scarce information. At a depth of 24–25 km, in the lower crust, single, subhorizontal discontinuities were locally discovered. The Conrad surface is not visible. The whole crustal basement of the Wielkopolska Block is probably cut by numerous fractures, sometimes reaching the Moho boundary. In the upper part of the crust they correspond with inverse faults or steep overthrusts in the Variscan complex.

4. In the Odra Fault Zone, bounding the Wielkopolska Block to the SW, the continental crust is 25–26 km thick, and the transition zone exceedes 8 km in thickness, which together with an abrupt change of the Moho level can be taken as evidence of a crustal suture.

5. The Fore-Sudetic Block is characterized by a thinner, normal continental crust 28 to 30 km thick and a fairly distinct seismic boundary between the upper and lower crust (Conrad surface).

6. The block of the Sudetes has a crust distinctly thicker than the adjacent crustal blocks by 5–8 km. The VIIth DSS profile provides no information about any subhorizon-

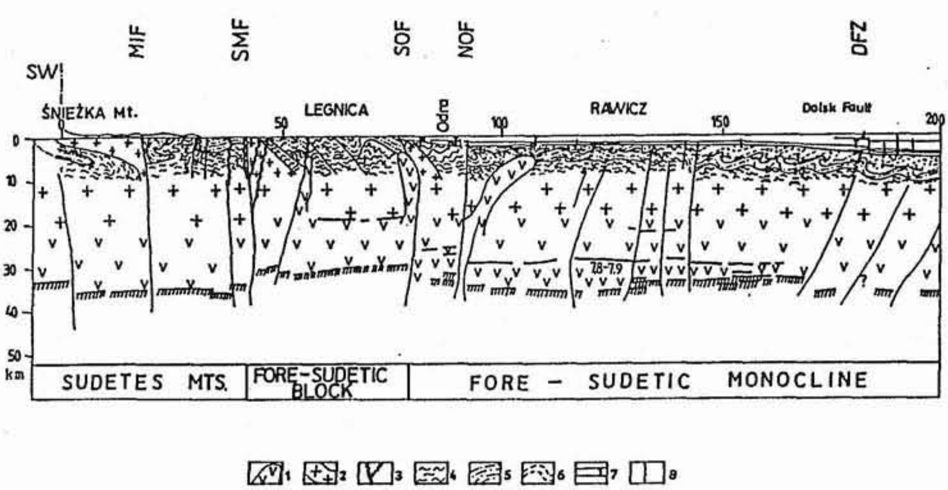


Fig. 8. Geological section along the VIIth international profile between the border of Poland and the Dolsk Fault Zone (after W. Pożaryski, 1975)

1 — mafic-ultramafic bodies; 2 — granites; 3 — basalts; 4 — gneiss-schist complexes; 5 — epimetamorphic complexes; 6 — Devonian–Lower Carboniferous folded deposits; 7 — platform cover; 8 — dislocations; SOF — Southern Odra Fault; NOF — Northern Odra Fault; other explanations as in Figs. 1 and 7

Przekrój geologiczny wzdłuż VII profilu międzynarodowego między granicą Polski a strefą uskokową Dolska (według W. Pożaryskiego, 1975)

1 — ciała maficzno-ultramaficzne; 2 — granity; 3 — bazalty; 4 — kompleksy gnejsowo-łupkowe; 5 — kompleksy epimetamorficzne; 6 — sfałdowane utwory dewońsko-dolnokarbońskie; 7 — pokrywa platformowa; 8 — dyslokacje; SOF — południowy uskok Odry; NOF — północny uskok Odry; pozostałe objaśnienia jak na fig. 1 i 7

tal, intracrustal discontinuity. The MIF, being undetected by seismic image and apparently not faulting the Moho, may be taken as a subvertical strike-slip feature.

7. The Elbe Block, next to the south, is separated from the Sudetes by the Lusatian Fault Zone, and is characterized by a crust 30–32 km thick (B. Beranek, A. Zatopek, 1981) with single, subvertical fractures reaching the Moho and several seismic discontinuities dipping gently southwards. The thickness of the upper part of the crust (granite-gneiss layer) seems to increase in the Elbe Block in relation to the Sudetes.

8. Crustal structure east and west of the VIIth international profile remains as yet unclear.

9. The first near-vertical reflection studies made in 1991 year along the profile GB-2, in its segment in the Wolsztyn — Leszno Block has already supplied some new data on the crustal structure (A. Guterch et al., 1991). In the uppermost crust (time interval 0–3 s) the reflection surfaces are due to the lithological boundaries within the platform cover. In the lower crust (time interval 8–11 s) there is another sequence of subhorizontal seismic inhomogeneities creating here a typically laminated seismic structure. The upper part of the consolidated crust (3–8 s) is characterized by lower reflection density. These are only preliminary results gained from the GB-2 in the Wielkopolska Block.

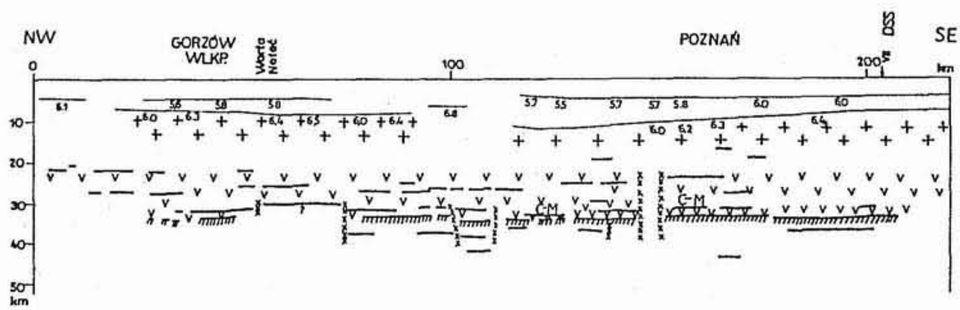


Fig. 9. Crustal structure along the M-13 profile (after T. Janik, R. Materzok, 1991)

C-M — crust-mantle discontinuity; seismic velocities in km/s are shown at refracted boundaries; other explanations as in Fig. 7

Struktura skorupy wzdłuż profilu M-13 (według T. Janika, R. Materzoka, 1991)

C-M — nieciągłość skorupa-płaszcz; przy granicach refrakcyjnych prędkości sejsmiczne podano w km/s; pozostałe objaśnienia jak na fig. 7

GRAVIMETRIC DATA

The area of the Variscides in Poland has been covered by a semi-detailed gravimetric survey (A. Kozera ed., 1981; T. Kruczek et al., 1985). This data was processed and transformed using the stripping method and presented by C. Królikowski, A. Grobelny (1991) in the form of a map of gravity anomalies, originating in the pre-Permian basement of southwestern Poland (Fig. 11). Having taken this map as the base the same team has elaborated several transformed maps of regional and residual anomalies after Griffin's method for radii of 5 and 12.5 km, respectively. The analysis of all these maps allows us to draw some conclusions pertaining to the geology of the pre-Permian basement complexes. Other possibilities of geological interpretation are connected with gravimetric modelling along some selected lines. The gravimetric modelling, pertaining to the whole crust, over the VIIth international profile, was recently carried out by T. Grabowska, M. Raczyńska (1991), and an alternative version was proposed by A. Pepel (1990). The results of more modelling of that type, along some other sections through the Sudetes and Fore-Sudetic Block were published by C. Królikowski, A. Grobelny (1991). Their depth range is within 3–5 km (Fig. 12).

Regional anomalies originating from the pre-Permian substratum represent the influence of basement levels 4–5 km deep, below the Permian base. The northern part of the Wielkopolska Block is characterized by an extensive, high positive anomaly elongated NW–SE, with a maximum of 60 mGal near Zielona Góra (gravity high of Wschowa). This gravimetric high has two crescent arms that detach from it and turn gradually southwards: one towards the Góry Sowie gneiss block and neighbouring ophiolitic complexes, the other stretches towards the Upper Silesia Massif (Fig. 11).

The Fore-Sudetic Block and the Sudetes Mts. areas (Fig. 11) lie inside the regional low and negative gravimetric anomalies, which are divided into two parts by the gravimetric high produced by rocks neighbouring the Góry Sowie Block. The boundaries delineated by the gravimetric gradient can be interpreted as a deep-seated linear feature,

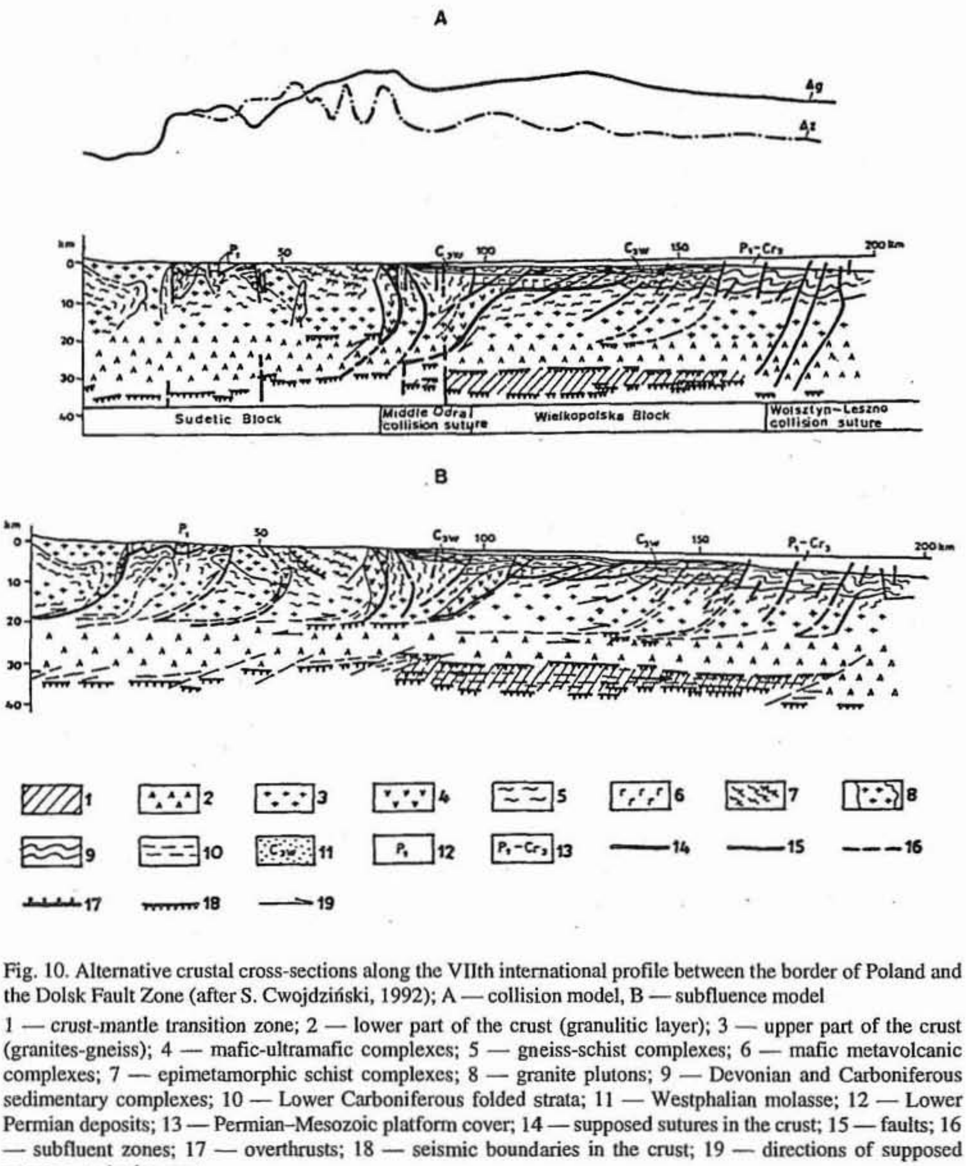


Fig. 10. Alternative crustal cross-sections along the VIIth international profile between the border of Poland and the Dolsk Fault Zone (after S. Cwojdziński, 1992); A — collision model, B — subfluence model

1 — crust-mantle transition zone; 2 — lower part of the crust (granulitic layer); 3 — upper part of the crust (granites-gneiss); 4 — mafic-ultramafic complexes; 5 — gneiss-schist complexes; 6 — mafic metavolcanic complexes; 7 — epimetamorphic schist complexes; 8 — granite plutons; 9 — Devonian and Carboniferous sedimentary complexes; 10 — Lower Carboniferous folded strata; 11 — Westphalian molasse; 12 — Lower Permian deposits; 13 — Permian–Mesozoic platform cover; 14 — supposed sutures in the crust; 15 — faults; 16 — subfluent zones; 17 — overthrusts; 18 — seismic boundaries in the crust; 19 — directions of supposed movements in the crust

Alternatywne przekroje skorupowe wzdłuż VII profilu międzynarodowego między granicą Polski a strefą uskokową Dolska (według S. Cwojdzińskiego, 1992); A — model kolizyjny, B — model subfluencyjny

1 — strefa przejściowa płaszcz-skorupa; 2 — dolna skorupa (warstwa granulitowa); 3 — górna skorupa (warstwa granito-gnejsowa); 4 — kompleksy maficzno-ultramaficzne; 5 — kompleksy gnejsowo-łupkowe; 6 — kompleksy maficznych metawulkanitów; 7 — kompleksy łupków epimetamorficznych; 8 — masywy granitoidowe; 9 — dewońsko-karbońskie kompleksy osadowe; 10 — sfałdowane utwory dolnego karbonu; 11 — molasa westfalska; 12 — utwory dolnego permu; 13 — permsko-mezozoiczna pokrywa platformowa; 14 — prawdopodobne szwy skorupowe; 15 — uskoki; 16 — strefy subfluencji; 17 — nasunięcia; 18 — granice sejsmiczne w skorupie; 19 — kierunki przypuszczalnych przemieszczeń w skorupie

roughly parallel to the Odra Fault Zone but shifted several kilometers southwestwards (Fig. 11). The gravimetric lows and highs here may be caused by either differences in the depth of the Moho, or by differences in the composition of the crust.

On the basis of the mentioned gravimetric data C. Królikowski, A. Grobelny (1991) presented a network of crustal lineaments matching some deep-seated features of the crust. Their nature remains, however, unclear (Fig. 11). The residual anomalies correspond with "shallow basement" and are supposedly connected with the upper part of the pre-Permian basement. The image of the residual anomalies in the western part of the Wielkopolska Block corresponds with the NW-trending fold-fault block type tectonics of the pre-Permian basement. The eastern part of this block is characterized by broader and randomly distributed residual anomalies, which can be explained as the masking influence of thick Lower Carboniferous deposits exerted upon more deep-seated causes of the gravimetric anomalies. The distinct belt of positive anomalies, coinciding with the OFZ, spreads along the NE margin of the Fore-Sudetic Block and points to the existence of mafic-ultramafic rock complexes within or close to this zone. Several broad, negative residual anomalies at the SW edge of the Fore-Sudetic Block and in the Sudetes Mts. area are connected with granite massifs out cropping at the surface or hidden merely beneath Cenozoic cover.

The southern connection of the positive anomaly of the Ślęża Mt. is attributed to the continuation of the heavy rocks under the Góry Sowie gneisses towards those of Nowa Ruda and Braszowice. Whether the gneisses have been trust upon ophiolite, or not, may be explained only by reflection seismics.

The mosaic image of the residual gravimetric anomalies in the Lower Silesia region is akin to the pattern shown by the structural-stratigraphic domains.

MAGNETIC DATA

The area of the ODEL and SUDET transects has been covered by semi-detailed magnetic and aeromagnetic survey, with the results published in the scale of 1:200 000 and 1:500 000, respectively. The general image of magnetic anomalies for the whole area (Fig. 13) is characterized by an irregular, mosaic pattern of elongated isoanomalies. From the magnetic point of view, one can distinguish here at least several magnetic provinces which coincide with some crustal blocks recorded by seismics.

The northern province corresponding with the Fore-Sudetic Monocline is an area of quiet magnetic field with small, local anomalies, gradually increasing in intensity towards the Upper Silesian Block. This area is bordered to the south by a remarkable narrow zone of intense positive anomalies, trending in a NW–SE direction, and marking the northeastern border of the Odra Block (Odra metamorphic unit) hidden below the platform cover. Parallel to the mentioned maximum zone, but farther to the south, the second narrow strip of positive anomalies runs along the southern fault (SOF in Fig. 8) of the Odra Block. The eastern section of this strip seems to turn southeasterly. The elongated minimum zone lying between the two maxima corresponds with the gneiss-schist complex of the Odra Block. Both positive magnetic strips indicate the presence of ultramafic-mafic complexes on either side of this block (considered as an easterly continuation of the Mid-German Crystalline Rise).

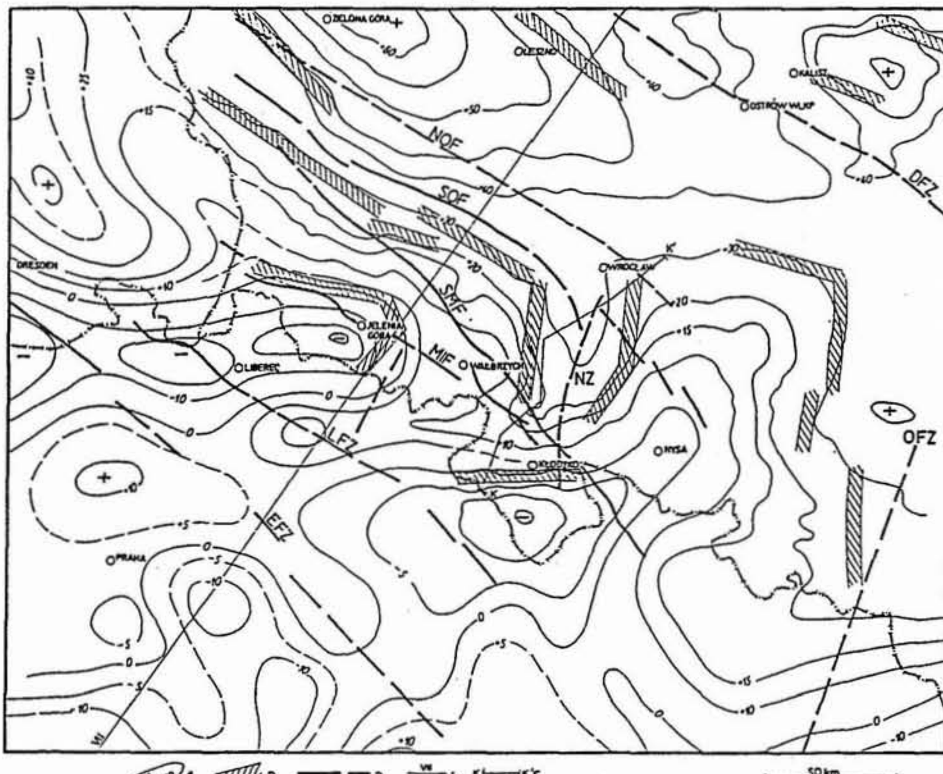


Fig. 11. Map of regional gravity anomalies from the pre-Permian basement of the ODEL and SUDET transects area (Griffin's method, $r = 5$ km) after C. Królikowski, A. Grobelny (1991), with data for Czech area from J. Ibrmajer (1981)

1 — isolines in mGal; 2 — deep fractures based on gravimetric data; 3 — main fault zones based on geological data; 4 — VIIth international profile of DSS; 5 — gravimetric modelling profile after C. Królikowski, A. Grobelny (1991); OFZ — Orlica Fracture Zone; other explanation as in Figs. 1, 7 and 8

Mapa regionalnych anomalii grawimetrycznych od podłoża podpermskiego dla obszaru transektów ODEL i SUDET (metoda Griffina, $r = 5$ km) według C. Królikowskiego, A. Grobelnego (1991), uzupełniona danymi czeskimi (J. Ibrmajer, 1981)

1 — izolinie w mGal; 2 — głębokie rozłamy wyznaczone na podstawie danych grawimetrycznych; 3 — głębokie rozłamy wyznaczone na podstawie danych geologicznych; 4 — linia VII profilu międzynarodowego (EU-3); 5 — linia modelowania grawimetrycznego według C. Królikowskiego, A. Grobelnego (1991); OFZ — strefa rozłamu orlickiego; pozostałe objaśnienia jak na fig. 1, 7 i 8

The Fore-Sudetic Block and the Sudetic Block have a similar magnetic pattern (Fig. 13), except for the Ślęża Mt. region in the latter, where a distinct, strip, positive anomaly is connected with serpentinites and gabbros, usually referred to as a part of the Sudetic ophiolite.

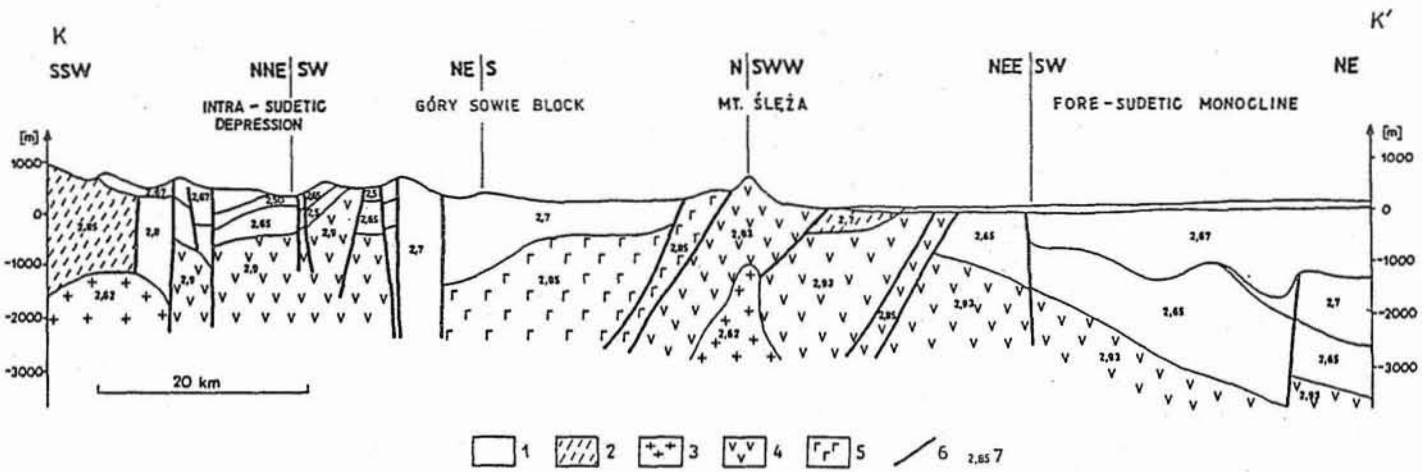


Fig. 12. Gravimetric modelling along K–K' line, (after C. Królikowski, A. Grobelny, 1991)

1 — rocks of densities as gneisses, schists and sediments; 2 — rocks of densities transitional to amphibolites; 3 — rocks of granite density; 4 — rocks of gabbro density; 5 — rocks of serpentinite density; 6 — faults; 7 — densities assumed for the modelling in g/t

Modelowanie grawimetryczne wzdłuż przekroju K–K' (według C. Królikowskiego, A. Grobelnego, 1991)

1 — utwory o gęstościach gnejsów, łupków i skał osadowych; 2 — utwory o gęstościach pośrednich do amfibolitów; 3 — utwory o gęstościach granitów; 4 — utwory o gęstościach gabr; 5 — utwory o gęstościach serpentynitów; 6 — uskoki; 7 — gęstości przyjęte dla modelowania w g/t

Another very distinct positive anomaly, elongated in the NW–SE direction, occurs in the E part of the Intra-Sudetic Depression, within the Sudetic Block, which corroborates the supposed existence of amphibolites, diabases and ultramafics under its sedimentary infilling. The intense horizontal gradient of both anomalies point to rather steeply dipping boundaries of the magnetically active bodies.

The picture of the magnetic field in the Elbe Block is also generally similar to the mosaic pattern of blocks located to the NE. It has a weak positive background, but in the southern part of this block, there is a weak negative magnetic field with local positive anomalies.

The magnetic field in the Moravo-Silesian Zone (East Sudetes) displays a more differentiated character, where elongated positive anomalies trending in a NNE–SSW direction match the structural grain of the region.

MAJOR FAULT ZONES

The ODEL transects along its path, six major, NW-trending fault zones, mostly of composite wrench and normal type, roughly parallel to the Teisseyre-Tornquist Line. The polyphase histories of at least part of them include a significant component of dextral strike-slip (Fig. 1).

The Dolsk Fault Zone (DFZ) bounds on the NE the elevated element of metamorphic basement in the Wolsztyn — Leszno Block and must have been active since Carboniferous time, controlling by synsedimentary faults the deposition of the Visean–Namurian flysch and then the Permian overstep succession. It is known only from subsurface data, corroborated by the deep seismic survey along the VII th international profile in the form of a ca. 2 km high step in the Moho level, with either steep fault or thrust ramp geometry (Figs. 1, 7).

The Odra Fault Zone (OFZ) is also unexposed. Drill cores from metamorphic rocks with subvertically disposed foliation contain evidence of kinematically unconstrained cataclastic and mylonitic deformation. Its impact on the Moho level is even greater, since it makes a step in the Moho ca. 4 km high, but again it is unclear whether due to normal fault or thrust detachment. The kinematic history of the OFZ also started during the Early Carboniferous, possibly even in Devonian times (K. Wierzchowska-Kicułowa, 1984). The ductile sheared rocks occur there in a zone (the Odra Block) several kilometers wide (Figs. 1, 3, 7–9), bounded on either side by deep, crustal faults, the Northern Odra Fault (NOF) and Southern Odra Fault (SOF), respectively. The latter, reactivated in the Triassic, controlled the development of the Fore-Sudetic Monocline.

The Sudetic Marginal Fault (SMF) produced the Sudetic horst during Tertiary block movements, and some traces of its activity are known even in Recent times. The sedimentary record on either side points to the onset of the SMF in the Late Carboniferous. It is a deep crustal feature because the Moho has been shifted on it by ca. 6 km (normal or thrust fault?). Hence, the presently lowered Fore-Sudetic Block actually has a thinner crust relative to the Sudetes Mts.

The Main Intra-Sudetic Fault (MIF) is unknown from the surface in the ODEL section, but the 25 km long fragment well exposed further to the west, between the IKB and GK,

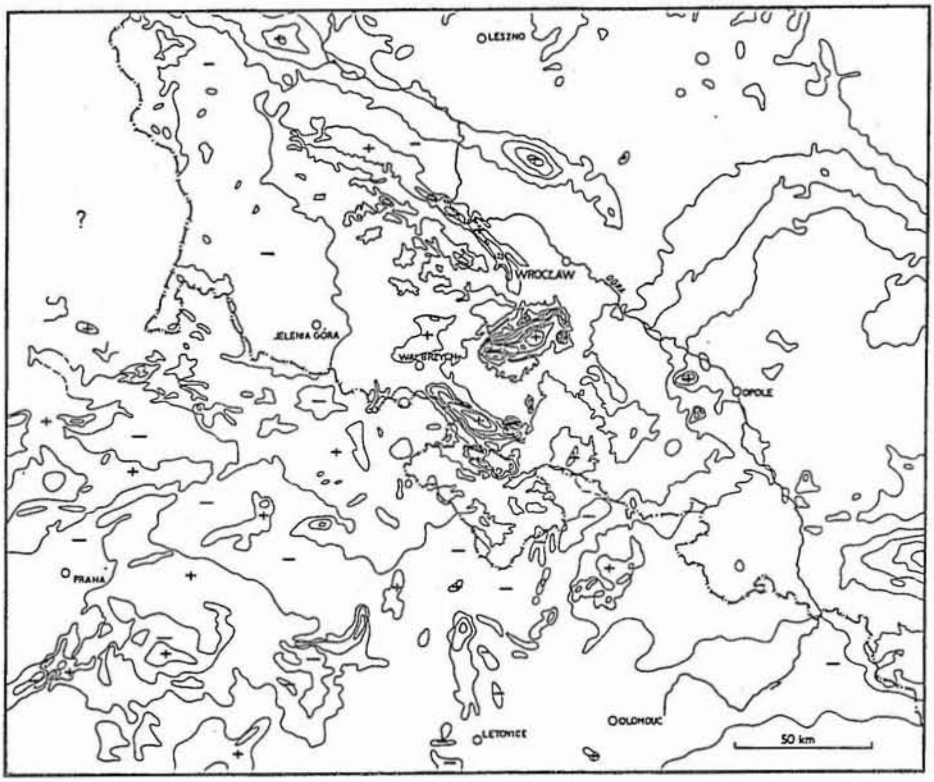


Fig. 13. Magnetic map of the ODEL and SUDET transects area, compiled from the *Magnetic map of Poland* and relevant Czech data

Mapa anomalii magnetycznych obszaru transektów ODEL i SUDET opracowana na podstawie *Mapy magnetycznej Polski* i danych czeskich

bears clear evidence of the sinistral wrench displacement at a temperature of > 500°C, followed by dextral transpression in greenschist conditions, which preceded the intrusion of the ca. 330 Ma old Karkonosze granite. The latter has remained unaffected by the ductile deformation on the MIF (Figs. 1, 3, 5). This fault zone is invisible in the VIIth international profile (Figs. 7, 8).

The Lusatian Fault Zone (LFZ) occurs west of the ODEL, and at the surface comprises the Lusatian Thrust, displacing the Lusatian Anticlinal Zone southwesterly over the Upper Cretaceous. In the seismic image it appears as a deep crustal fracture also showing the southwesterly vergence (Fig. 7).

The Elbe Fault Zone is a complex structure, where the earlier, likely N-vergent imbrication was overprinted by younger S/SW-vergent thrusting (P. Bankwitz, E. Bankwitz, 1990). As in the case of MIF, its southeastern continuation is expected to reach the Moldanubian/Moravian boundary, hence both features can be spotted by the proposed ODEL transect.

The SUDET cuts across at least two major fault zones. One of them, coinciding with a pronounced photolineament (J. Mroczkowski, 1992), runs along the eastern flank of the IKB (Figs. 1, 4, 5), with clear evidence of the high-angle normal faulting at greenschist conditions, connected with the Tournaisian onset of a thick, rapid sedimentation in the Intra-Sudetic Basin (K. Dziedzic, A. K. Teisseyre, 1990).

The other, considered as the northern continuation of the Moldanubian thrust, appears east of the Góry Sowie Block (GSB) and traditionally has been located in the Niemcza Zone (NZ in Fig. 5). However, the NZ is actually occupied mostly by nonmylonitic granitoids of ca. 340 Ma age, poorly sheared metasedimentary rocks and massive serpentinite. Thus the Moldanubian Thrust Zone (MTZ in Figs. 1, 5) should be expected to occur further east and coincide with a belt of inverted metamorphic zonation and strongly sheared orthogneisses of the Strzelin and Doboszowice area, all extensively stitched by the Variscan granite.

CONCLUSIONS

The ODEL profile runs from the north to the south through: (1) metamorphic basement of likely Early Paleozoic age, (2) unmetamorphosed folded sequence of Devonian and Lower Carboniferous flysch, considered as a continuation of the Rhenohercynian Zone, (3) medium-grade metamorphic rocks and granitoids, considered as a continuation of the Mid-German Crystalline Rise, (4) low-, mid- and high-grade rocks of the Fore–Sudetic Block, including fragments of ophiolite bodies and post-kinematic Variscan granitoids, (5) Góry Sowie gneiss complex and (6) composite Bardo succession comprising unmetamorphosed both autochthonous and allochthonous elements (7) Variscan granitoid massif, (8) orthogneisses and schist-phyllite complex of the OSD, with high pressure eclogite and granulites, (9) Variscan Devonian–Lower Carboniferous succession at the Moldanubian (*s. l.*)/Moravian boundary, and ending in (10) Cadomian granitoids hidden below Lower Carboniferous flysch and close to another ophiolite complex of the LCU.

The proposed orientation of ODEL has been chosen to make a continuation of the already started GB-2 profile in the vicinity of Leszno. However, a southerly completion of the GB-2 project has still been doubted due to financial reasons. Therefore, any shorter profile, trending NE–SW, thus located perpendicularly to the major fault zones (OFZ and EFZ) and to the Sudetic grain can be recommended instead.

The SUDET enters the Western Sudetes at (1) the Cadomian block of Lausitz, next runs across (2) the Ordovician igneous and bimodal volcanic rocks with some HP signature and accompanying Ordovician(?)–Silurian(?) greenschist metasediments developed before the Early Carboniferous, then cuts (3) thick sediments of Carboniferous–Permian age, enters (4) high-grade gneiss-migmatite complex of GSB uplifted prior to the Late Devonian, continues eastward through (5) extremely lithologically mottled, low- to high-grade rocks, ophiolite inclusive, developing at least between 500–300 Ma, Cadomian orthogneisses and ubiquitous Variscan (mixed-magma) granite stitching the Moldanubian-Moravian block boundaries, then through (6) Cretaceous cover overlying that boundary, (7) Variscan (Upper Devonian/Lower Carboniferous) flysch, and finally enters (8) another Cadomian block of the Upper Silesia--Brunnia (Brunovistulicum), covered with the Upper Carboniferous coal-bearing molasse.

Accordingly, the proposed seismic profiles are to run through a mosaic of tectono--stratigraphic units, possibly terranes, with contrasting lithology and likely originating in different geodynamic settings. Thus their boundaries can be expected as potentially good reflectors, helping to unravel deep structures of the crust and Moho in the region supposed to comprise tectonostratigraphic terranes of different derivation and even to contain important lithospheric plate junctions.

Translated by the Authors

Instytut Nauk Geologicznych
Polskiej Akademii Nauk
Wrocław, ul. Podwale 75
Oddział Dolnośląski
Państwowego Instytutu Geologicznego
Wrocław, al. Jaworowa 19
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Andrzej ŻELAŹNIEWICZ, Stefan CWOJDZIŃSKI

DWA SEJSMICZNE PROFILE REFLEKSYJNE W POŁUDNIOWO-ZACHODNIEJ POLSCE: PROPOZYCJA

Streszczenie

W artykule krótko przedstawiono istniejące dane geologiczne i geofizyczne dla obszaru Polski południowo-zachodniej. Na tej podstawie autorzy proponują wykonanie dwóch nowych profili refleksyjnych, przecinających strukturę sudecką w kierunku N-S (ODEL) i w kierunku WNW-ESE (SUDET). Eksperymenty geofizyczne ukierunkowane na rozpoznanie wgłębnej struktury skorupy ziemskiej, wykonywane dotychczas w Polsce, są związane z badaniami strefy Teisseyre'a-Tornquista. Jedyny profil sejsmiczny przecinający Sudety i blok przedsudecki to VII profil międzynarodowy, który został wykonany 20 lat temu techniką refrakcyjną. Proponowane obecnie sejsmiczne transekty refleksyjne mają za zadanie rozpoznanie waryscyjskich struktur skorupowych w NE części Masywu Czeskiego dla porównania ich ze strukturami stwierdzonymi już w obrębie waryscydów środkowej Europy, poza granicami Polski.

ODEL, nawiązujący do częściowo wykonanego profilu GB-2, przebiega z północy na południe, od strefy uskokowej Dolska do strefy uskokowej Łaby. Przecina on: (1) elewację epizonalnych skał Leszna — Wolsztyna, (2) strefę sfałdowanych, dewońsko-dolnokarbońskich utworów osadowych, leżących w podłożu monokliny przedsudeckiej, a reprezentujących w głównej mierze synorogeniczne osady waryscyjskie, (3) mezometamorficzne skały o stromo zapadającej foliacji oraz granitoidy strefy środkowej Odry, (4) przykryte kenozoikiem, epi- i mezozonalne kompleksy bloku przedsudeckiego, o słabo poznanych związkach ze strukturą sudecką, wraz z fragmentami ofiolitów i postkinematycznymi ciałami granitoidów waryscyjskich, (5) gnejsowy blok Gór Sowich, podścielony kwaśnymi skałami w części zachodniej i ofiolitem sudeckim w części wschodniej, (6) sekwencję bardzką złożoną z allochtonicznych i autochtonicznych, niezmetamorfizowanych elementów (ordowik-karbon dolny), (7) kompleks kopuły orlicko-śnieżnickiej, z fyllitami, łupkami, gnejsami i ortognejsami, w którym występują relikty wysokociśnieniowych eklogitów i granulitów, (8) waryscyjską sukcesję dewońsko-dolnokarbońską na granicy moldanubiku i strefy morawsko-śląskiej, i kończy się w (9) bloku kadomskich granitoidów, ukrytych pod fliszem dolnego karbonu, niedaleko kompleksu ofiolitowego Letovic na Morawach.

SUDET wkracza w obręb Sudetów Zachodnich od strony (1) kadomskiego bloku Łużyc, przecina (2) dolnopaleozoiczny kompleks granitowo-ortognejsowy bloku izersko-karkonoskiego, intrudowany przez waryscyjski granit Karkonoszy, (3) metamorfik wschodniej osłony tegoż granitu, złożony z ordowickich(?) metagranitoidów i bimodalnych sekwencji wulkanicznych, z reliktami niebieskich amfiboli, starszych od regionalnego metamorfizmu w facji zieleńcowej, oraz z dolnopaleozoicznych epizonalnych skał metaosadowych, (4) następnie wkracza na obszar depresji śródsudeckiej, wypełnionej grubymi sekwencjami molasowymi karbonu i permu, (5) przebiega przez blok Gór Sowich, (6) strefę Niemczy oraz pas wychodni słabo odsłoniętego metamorfiku Wzgórz Strzelińskich, w obrębie którego waryscyjskie granitoidy zabliźniają szew graniczny bloku moldanubskiego (zachodniosudeckiego = lugijskiego) i morawsko-śląskiego, (7) przecina pokrywę utworów górnokredowych, leżących na sfałdowanym, waryscyjskim fliszu Sudetów Wschodnich i (8) wkracza w obręb innego kadomskiego bloku — Górnego Śląska, łączącego się z blokiem Brunni, pokrytego węglonośną molasą waryscyjską.

Proponowane profile sejsmiczne przebiegają przez mozaikę jednostek tektono-stratygraficznych (może terranów?) o kontrastowej litologii, prawdopodobnie powstałych w różnych warunkach geodynamicznych. Ich granice są potencjalnie dobrymi reflektorami sejsmicznymi, przeto poznanie ich położenia i geometrii mogłoby umożliwić odtworzenie wgłębnej struktury waryscydów w Polsce.