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THE CARBONIFEROUS IN SOUTH-WESTERN POLAND

UKD 551.735.1/.2.02:552.181:551.241:552.5+552.312/313(438–14)

Carboniferous rocks crop out at the surface or occur beneath cover of younger ones in polygenic Sudetic structure which comprises the Sudety Mts proper, Fore-Sudetic Block and adjoining part of the Fore-Sudetic Monocline (16). The cover is represented by Permian and younger rocks in the Sudety Mts and Fore-Sudetic Monocline, and Cenozoic ones in area of the Fore-Sudetic Block (see Fig. 1).

The Sudetic structure forms north-eastern margin of the Bohemian Massif and, as it is widely accepted, it is situated within inner belt of the European Variscides, within boundaries of the Sudetic-Saxo-Thuringian zone or, in a wider sense – Franco-Bohemian zone. Such setting and the presence of a small but widely known coal basin make analysis of distribution and differentiation of Carboniferous rocks in the Sudetic structure and its neighbourhood important not only from theoretical point of view.

Within the area of the above structure, the Carboniferous is represented by sedimentary and volcanic rocks and granitoid intrusions. New data, especially stratigraphic and lithostratigraphic ones, make possible some modification of the hitherto accepted views on conditions under which Carboniferous rocks were originating in south-western Poland. They also make it possible to draw some conclusions concerning geological setting of black coal deposits in the Lower Silesia and perspectives of further discoveries. The present paper deals mainly with the two latter problems.

STRATIGRAPHIC AND TECTONIC PROBLEMS

Dinantian. Lower Carboniferous rocks known from various units in the Sudetic structure are varying in age as well as lithological and facies development. Arcosic siltstones and claystones occurring north of Zgorzelec presumably belong to the Tournaisian. Identical rocks, known from a neighbouring area in the GDR were found to comprise conglomeratic layers with pebbles yielding Upper Devonian conodonts (4). The lowermost Tournaisian is presumably also present further to the east, in the Kaczawa structure (6). The thickness of Tournaisian rocks is still not established there. In the Moravo-Silesian basin, the Tournaisian is represented by maybe deep-water sediments: shales with radiolarite intercalations and layers of volcanic rocks and limestones.

A huge complex of polymictic conglomerates, over 2,000 m in thickness, is present in a small structural unit known as the Świebodzice depression in central part of the Sudety Mts. Sedimentation of these rocks started in the Late Devonian in marine environment, which is evidenced by the wealth of neritic fauna described from limestone intercalations in lower part of that complex by T. Gunia (10). It ended presumably in the Early Tournaisian which is suggested by poor floristic record. Poorly seggregated detrital material coming from neigbouring areas, including Sowie Góry Mts gneiss block, has been deposited there in the form of alluvial cones (19).

It follows that in times of sedimentation of maybe deep-water rocks of the shaly-volcanic association in the Moravo-Silesian zone and within limits of the Kaczawa structure, deposits of mountain streams with high but short-distance carrying capability have been originating at the foot of local elevation in the central Sudety Mts.

On the above discussed deposits of the Świebodzice depression, there have been overthrusted, maybe gravitationally, Cambrian greenstones and diabases of the neigbouring Kaczawa structure (19). That event is difficult to date and it may be only assumed to have taken place before the onset of accumulation in the neighbouring Central Sudetic depression.

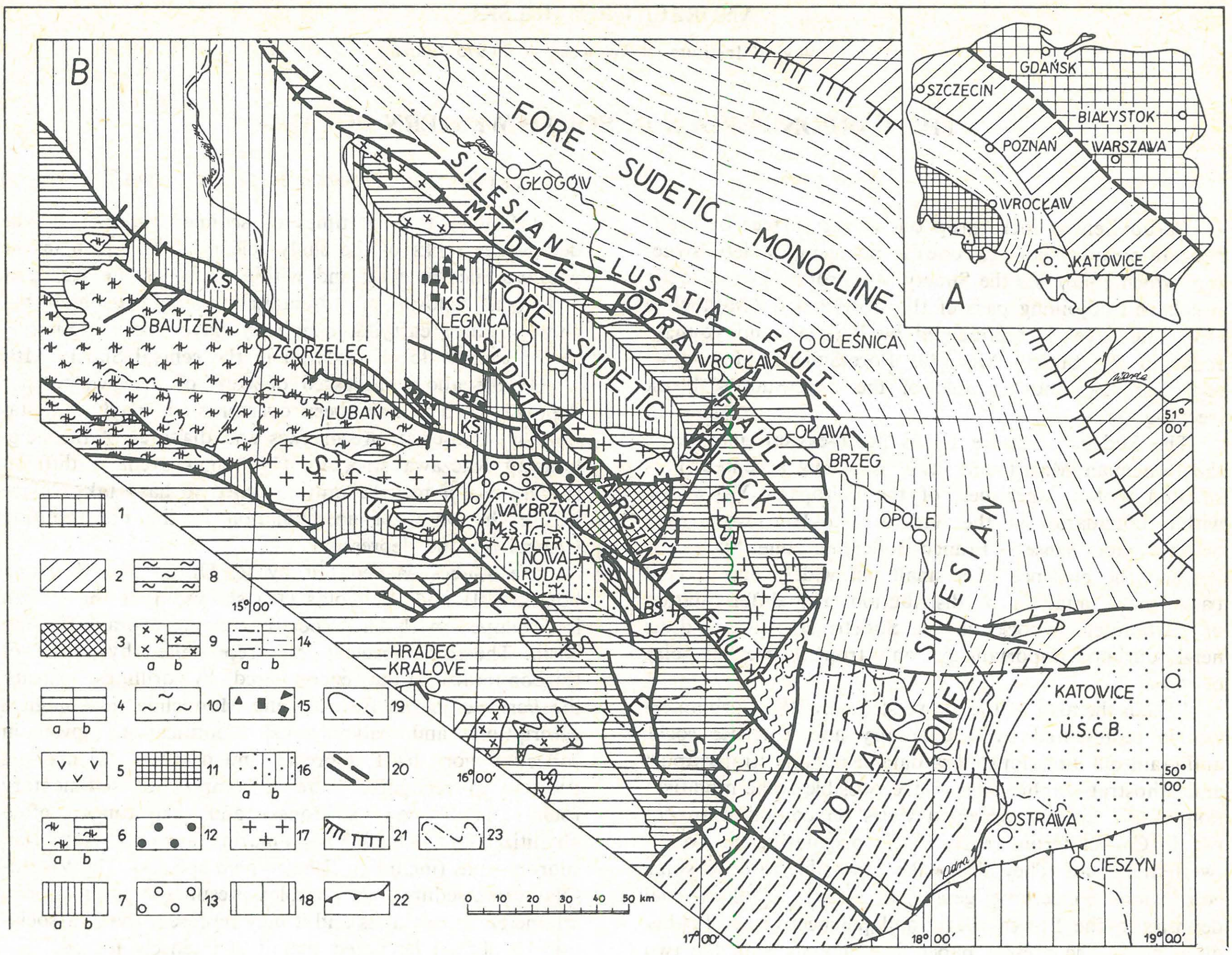
The studies carried out by R. Unrug and Z. Dembowski (21) and A. Kotas (11) showed that the Visean is developed in flysch association in the Moravo-Silesian basin. The same association is represented by a part of Carboniferous strata encountered by drillings beneath the Permian in the Fore-Sudetic Monocline. Lithological descriptions and palynological identifications given in collective work by T. Górecka and others (7, 8) make it possible to recognize there a complex of sedimentary rocks: sandstones, siltstones and claystones, often phyllitized and yielding Visean marine fauna and Namurian sporomorphs (including *Schulzospora* species). The Visean-Namurian sedimentary complex presumably attains a few kilometers in thickness and it may represent flysch association. It should be noted that it is intensely folded.

A second, younger Carboniferous complex is built of arcosic sandstones and the recorded spores (including *Levigatisporites*, *Punctatisporites* and *Tymospora*) suggest that it corresponds to the uppermost Westphalian and most probably Stephanian. It is separated from the older by a marked stratigraphic gap and presumably angular unconformity. It may be assumed that the younger complex represents molasse association.

In central Sudety Mts, and intramontane depression (known in the literature as Central Sudetic Depression or Basin) presumably originated as early as the Tournaisian. However, paleontological record for basal part of its sediments are still missing. Cyclic sedimentation of conglomerates and sandstones developed in fluvial, lacustrine-fluvial and lacustrine facies, was presumably taking place there in the Late Tournaisian and Visean. Sets of cyclothems form a number of lithostratigraphic units. Their origin was mainly controlled by tectonic factors – uplift of ranges surrounding this depression of the "basin and range" type (20).

In the Late Visean, the Central Sudetic Depression has been affected by a short-lasting marine ingression. It resulted in origin of coarse detrital rocks of the Szczawno Fm., with good faunistic record. The thickness of the Dinantian in this depression is estimated at about 4,000 m.

In the Bardo structure and adjoining part of the Kłodzko metamorphic massif, situated in the neighbourhood of the above depression, detrital rocks are accompanied by layers of bioclastic limestones with fragments of limestones and shales of the Upper Devonian and Lower Carboniferous age, developed in littoral and neritic facies

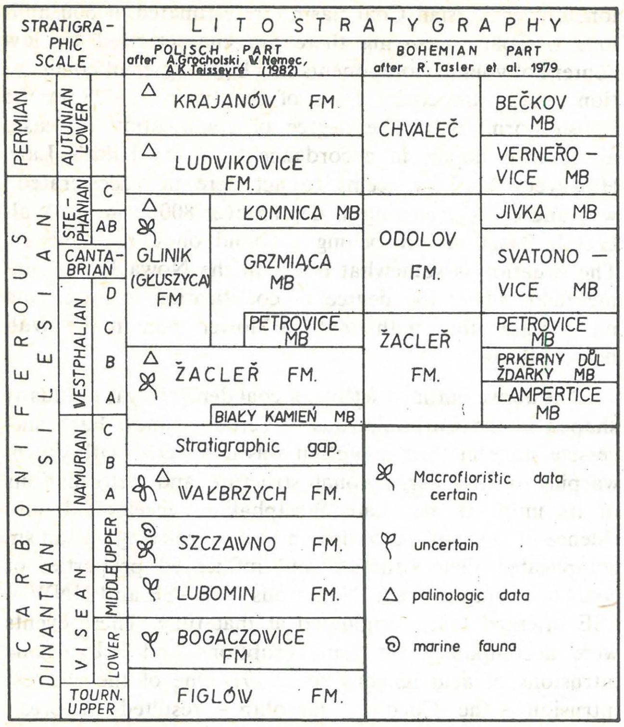


Ryc. 1. A – Szkic tektoniczny Polski (bez utworów permu i młodszych); B – szkic tektoniczny Polski południowo-zachodniej i obszarów przyległych (bez utworów permu i młodszych).

1 – proterozoiczna platforma wschodnioeuropejska, 2 – kaledonidy SW obrzeżenia platformy wschodnioeuropejskiej. Utwory podłoża i wczesnych etapów rozwoju geosynkliny waryscyjskiej (3 – 11): 3 – gnejsy Sowich Gór – górny proterozoik, 4 – mezozonalnie zmienione skały Sudetów i bloku przedsudeckiego – górny proterozoik i dolny kambr (a, b – patrz niżej „inne oznaczenia"); intruzje wczesnopaleozoiczne: 5 – zasadowe i ultrazasadowe, 6 – kwaśne, 7 – utwory epizonalnie zmienione w Sudetach i bloku przedsudeckim – najwyższy proterozoik po dewon włącznie, 8 – utwory najwyższego proterozoiku i paleozoiku w strefie dyslokacyjnej Niemczy, 9 – granitoidy nieokreślonego bliżej wieku, 10 – skały osadowe dewonu w strefie morawsko-śląskiej, 11 – nie rozdzielone utwory skalne strefy wewnętrznej waryscydów (na ryc. 1A). Utwory późnych etapów rozwoju geosynkliny waryscyjskiej (12 – 17): 12 – osady grubookruchowe – górny dewon – najniższy dinant w depresji Świebodzic, 13 – detrytyczne utwory asocjacji molasowej w zapadlisku Sudetów Środkowych – dinant, 14 – utwory asocjacji fliszowej w strefie morawsko-śląskiej i w podłożu monokliny przedsudeckiej – dinant – dolny namur A, 15 – utwory olistostromowe „wildflysch" w strukturze kaczawskiej i bardzkiej – dinant, 16 – utwory molasy młodszej – węglonośnej w zapadlisku Sudetów Środkowych i w Górnośląskim Zagłębiu Węglowym, 17 – granitoidy późnowaryscyjskie. Struktury powaryscyjskie: 18 – utwory fliszu karpackiego w strefie fałdowań alpejskich. Inne oznaczenia: ryc. 1B: a – utwory skalne na powierzchni lub pod osadami kenozoicznymi, b – pod utworami najwyższego silezu, permu i młodszymi, 19 – granice geologiczne stwierdzone i przypuszczalne, 20 – uskoki stwierdzone i przypuszczalne, 21 – przypuszczalny przebieg zewnętrznej granicy waryscydów, 22 – krawędź nasunięcia karpackiego, 23 – granica państwa. BS – struktura bardzka, KS – struktura kaczawska, MST – zapadlisko śródsudeckie, SD – depresja Świebodzic, USCB – Górnośląskie Zagłębie Węglowe.

Fig. 1. A – Tectonic sketch map of Poland (without Permian and younger strata); B – tectonic sketch map of south-western Poland and adjoining areas (without Permian and younger strata).

1 – Proterozoic East-European Platform, 2 – Caledonides at SW margin of the East-European Platform. Basement and rocks related to early stages in development of Variscan geosyncline (3 – 11): 3 – Sowie Góry gneisses – Upper Proterozoic, 4 – mesozonally alterated rocks in Sudety Mts and Fore-Sudetic Block – Upper Proterozoic and Lower Cambrian (a, b – see Other Explanations, below); Lower Paleozoic intrusions: 5 – basic and ultrabasic, 6 – acid, 7 – epizonally altered rocks in Sudety Mts and Fore-Sudetic Block – the uppermost Proterozoic – Devonian, inclusively, 8 – the uppermost Proterozoic and Paleozoic rocks in Niemcza dislocation zone, 9 – granitoids of uncertain age, 10 – Devonian sedimentary rocks in Moravo-Silesian zone; 11 – unsubdivided rocks of inner Variscan zone (in Fig. 1A). Rocks related to late stages in development of the geosyncline (12 – 17): 12 – coarse-detrital rocks – Upper Devonian – the lowermost Dinantian in Świebodzice depression, 13 – detrital rocks of molasse association in Middle-Sudetic Trough – Dinantian, 14 – rocks of flysch association in Moravo-Silesian zone and Fore-Sudetic Monocline basement – Dinantian – Lower Nanumian A, 15 – olistostrome "Wildflysch" rocks in Kaczawa and Bardo structures – Dinantian, 16 – young coal-bearing molasse rocks in Middle-Sudetic Trough and Upper Silesian Coal Basin, 17 – Late Variscan granitoids. Post-Variscan structures: 18 – Carpathian flysch rocks in zone of Alpine foldings. Other explanations: Fig. 1B: a – rocks cropping out at surface or beneath Cenozoic, b – overlain by the uppermost Silesian, Permian and younger rocks, 19 – controlled and inferred geological boundaries, 20 – controlled and inferred faults, 21 – inferred course of external boundary of Variscides, 22 – margin of Carpathian overthrust, 23 – state boundary; BS – Bardo Structure, KS – Kaczawa Structure, SD – Świebodzice depression, MST – Middle-Sudetic Trough, USCB – Upper Silesian Coal Basin.



Ryc. 2. Perm i karbon w Sudetach Środkowych.

Fig. 2. Permian and Carboniferous in the Middle-Sudetic Trough.

according to M. Chorowska and K. Radlicz (oral inf.). Limestone olistoliths found by them at Dzikowiec, east of Nowa Ruda, are of the same age. It should be added here that B. Wajsprych (22) suggested the presence of sedimentary-tectonic units of various types in the Bardo structure. The presence of rocks of the olistostrome type is usually unquestioned whereas olistotrymata and olistonappe remain the subject of vivid discussions and they should be treated in terms of working hypotheses only.

M. Chorowska and L. Sawicki (6) found rocks of the flysch type in the Kaczawa structure in the vicinities of Lubań, dating them at the Upper Visean on the basis of conodonts. In other unit of the same structure, Z. Baranowski and A. Haydukiewicz (2) identified rocks of the melange and olistostrome type, comprising olistoliths of Ordovician greywackes and shales and Devonian siliceous shales. The question of age of olistostrome rocks of the Kaczawa structure remains open but it is assumed that they have originated in the Late Visean. Thickness of these rocks is unknown.

The studies on facies variability of Dinantian rocks and their distribution in the Sudetic structure suggest (see Fig. 1) that the Central Sudetes and a part of the Western were subjected to both uplifting and significant horizontal movements in the Dinantian. One of the earliest stages of uplift is reflected by a thick complex of detrital rocks of the uppermost Devonian and lowermost Carboniferous in the Świebodzice depression. Further effects of the uplift could include gravitational slide of Cambrian greenstones and diabases on the above mentioned detrital rocks in the depression. Subsequently, the Central Sudetic intramontane depression began to develop in area of the uplifting range and to be infilled with rocks of the molasse type.

In the Dinantian, a basin began to develop and gradually infill with sediments of the flysch association at the external side of the uplifting prae-Sudetes, i.e. in the east and north. Horizontal movements were continuing and deposits of the olistostrome type were forming in the front of rising nappes. The deposits are fragmentarily preserved in the Bardo and Kaczawa structures and probably at the northern extension of the latter, in the Fore-Sudetic Block. This seems to be shown by resulted of drillings Biskupin IG 1, Nowa Kuźnia IG 2 and Chocianów IG 3 (5).

Differences in facies and degree of metamorphism of Devonian and Lower Dinantian rocks occurring at present in the Sudetic structure, often in close proximity, give further support for the hypothesis of large-scale horizontal translocations in the Dinantian. In the internal zone, corresponding to the present-day Central Sudetic Depression, the movements were without much importance, presumably because of rigidity of already consolidated basement. Significant horizontal movements have taken place north of the depression, at the boundary with external, flysch zone. Palinspastic reconstruction made by J. Oberc (17) showed offsets at distance of over 15 km. Conclusions drawn by that author, mainly on the basis of geometric reconstructions on cross-sections, require further support or supplement by results of facies analysis.

In concluding, it is worth to state that similar succession of events has been found west of the studied area, in north-eastern Bavaria, i.e. in the same Sudetic-Saxo-Thuringian zone of the European Variscides (3). There, large-scale horizontal translocations of rocks masses have taken place in the Late Devonian and Early Carboniferous, being accompanied by formation of rocks of the olistostrome type (Wildflysch).

Silesian. In the Late Carboniferous, area of sedimentation in the Sudetes was initially confined to northern part of the Central Sudetic Depression. A gradual transition from Visean sedimentary sequence, related to subaqueous part of delta, to Lower Namurian A developed in river channel and floodplain facies may be traced there. Similarly as in the Upper Silesian Coal Basin, neither angular unconformities nor significant breaks in sedimentation were found at the boundary of the Dinantian and Silesian (11). In the Sudetes, Dinantian rocks were dated on the basis of marine fauna by H. Żakowa (23) and the Silesian – on the basis of macroflora, reanalysed by J. Kuchciński (12). The borehole data (7, 8) suggest that transition from the Dinantian to Silesian (Lower Namurian) is also gradual in the basement of the Fore-Sudetic Monocline.

In the Central Sudetic Depression, the oldest Silesian rocks are assigned to the Wałbrzych Fm. They are represented by sandstones and some quartz conglomerates as well as siltstones and claystones with coal layers. There are about 38 layers and intercalations of black coals and total thickness of the Wałbrzych Fm. is varying from 250 to 320 m. In the Moravo-Silesian zone and presumably Fore-Sudetic area, sedimentation of rocks of the flysch association ceased in early Namurian A.

Sedimentation of the next megacycle started in the Central Sudetic Depression in the Late Namurian, when continental conglomerates of the Biały Kamień Member of Žacleř Fm. began to form in its northern part. That member, although not everywhere developed, is up to 300 m thick. Upper members of the Žacleř Fm. are represented by sediments of river channel and floodplain facies: conglomerates, sandstones and claystones with almost 50 black coal seams. Summative thickness of rocks of that formation is close to 1,000 m.

The above formation is recognized in both Polish and Czechoslovakian parts of the Central Sudetic Depression.

However, there are some differences in interpretation of upper limit of that formation by Czechoslovakian (e.g. R. Tasler and others – 18) and Polish geologists (the present author and J. Miecznik, oral inf.). The former assign so called Petrovice Member (Westphalian C) to that formation whereas the latter consider these rocks as a part of a separate megacycle, differentiated as the Glinik Fm. in Polish part of the depression (9). J. Miecznik uses the name Głuszyce Fm. for these deposits. The units, however, are still not formally proposed. Stratigraphic extent of the Glinik (Głuszyca) Fm. is established at the Westphalian C – Upper Stephanian B, on the basis of sporomorph assemblages.

In southern, Bohemian part of the depression, there is recognized Odolov Fm. (odolovské souvrstvi) which may be treated as an equivalent of the Glinik Fm. The former comprises continental deposits and it displays numerous traces of volcanic activity: tuffs and tuffites as well as lava covers and shallow, subvolcanic intrusions. The rocks are silicified and albitized so their original mineral composition and, therefore, systematic position are difficult to establish. Coal resources are generally small and limited to some horizons in the Odolov Fm. Coal layers are generally lacking in the Glinik Fm., except for some intercalations of limited extent and thickness, found at Głuszyca and other places.

Both the Odolov and Glinik (Głuszyca) formation are characterized by concentrations of uranium compounds in their upper lithostratigraphic members. This gives certain practical value for appropriate lithostratigraphic correlation of units of the Silesian in south-western and north-eastern parts of the Central Sudetic Depression.

The Westphalian and Stephanian reflect gradual widening of area of sedimentation towards the south-east and the Stephanian – the onset of continental sedimentation in northern Sudety Mts. According to J. Milewicz (15), the Silesian is up to 500 m thick there.

In the Central Sudęty Mts, Westphalian and Stephanian rocks were originating in local basins, developing around uplifting Karkonosze granitoid massif. Isotopic datings made using various methods are consistent, showing that the granites are 297–300 Ma old.

In late Namurian and Westphalian, uplifted tectonic structures in area north of the Sudetic structure have been subjected to intense erosion and denudation. Rocks of that age are not known from that are or their record is disputable. Detrital continental rocks of the uppermost Stephanian and Lower Autunian represent the beginning of a new sedimentary cycle both in the Sudety Mts and their northern foreland, except for the Fore-Sudetic Block where the Silesian and Autunian are missing.

GEOLOGICAL SETTING OF BLACK COAL DEPOSITS IN THE LOWER SILESIA

In the Central Sudetic Depression, black coal deposits are known from the Wałbrzych and Žacleř formations. Black coals were there deposited in small local accumulational basins. Subsequent, mainly disjunctive deformations resulted in break up of the basins into numerous secondary elements, within which are situated black coal deposits nowadays mined in the Žacleř area in Czechoslovakian part of the depression and the Wałbrzych and Nowa Ruda areas in the Polish part.

Economical geological reserves (counted to the depth of 1,000 m) in Polish part of the Central Sudetic Depression, Lower Silesian Coal Basin, are estimated at 600 millions t. Coals occurring there are characterized by low content of volatile components and high degree of coalification. These are coaky coals of the types 34–38 in the Polish normatives. The degree of coalification increases along with depth, in accordance with the Hildt's Law. However, the Law seems to act here in "accelerated" way and coals occurring at depths over 800 m in the Wałbrzych Basin mainly belong to blind ones, the type 38. The situation is somewhat better in the Nowa Ruda mining field, where the degree of coalification is lower and its increase along with depth is slower than in the Wałbrzych Basin.

The above outlined setting of coal deposits was gradually shaped in the Carboniferous – Tertiary times. Each successive stage in their evolution was connected with downwarping of the depressional structure and deformations of its infill. In the Late Westphalian, accelerated subsidence of floor of the basins and accompanying volcanism complicated their structure and influenced properties of coals occurring in them. Numerous NW–SE and NNW–SSE oriented faults originated at that time. These events were accompanied by some eruptions and subvolcanic intrusions of acid igneous rocks (9). One of the greatest intrusion – the Chełmiec laccolith – resulted in break up of the original Wałbrzych Basin into secondary elements: Gorce syncline, Chełmiec dome and Sobięcin syncline. The studies carried out by B. Kwiecińska (14) showed that temperature of intruding magma was close to 970°K but extent of thermal effect of the intrusion was limited to 30 cm. A high geothermal gradient, so typical of active volcanic areas, appears responsible for high metamorphism of coals in the Lower Silesia, as it has been pointed out by A. Grocholski (1) and recently well supported by T. Kułakowski (13).

In the Rotliegendes, downwarping movements and volcanic activity became once more intensified. This resulted in a steeper inclination of rock packets with coals, a new increase of geothermal gradient and origin of a barrier of volcanic rocks, delineating the coal deposits of the Wałbrzych Basin in the south.

The last of major stages in evolution of the Lower Silesian Coal Basin was connected with uplift of the Sudety Mts in the Tertiary. It resulted in origin or rejuvenation of numerous NW–SE and NNW–SSE oriented faults. Mining works showed that hazard of carbon oxide explosions is the greatest in mining fields cut by NNW–SSE and similarly oriented faults. According of one hypothesis, this gas is of juvenile origin and it represents a relict of volcanic phenomena accompanying tectonic rejuvenation of the Sudety Mts in the Tertiary.

Coal deposits of the Lower Silesia differ from the Upper Silesian ones mainly in markedly smaller size and resources, high metamorphism, incomplete stratigraphic sections, effects of volcanic phenomena and intense faulting of individual seams, and from the Czechoslovakian – in markedly higher thickness of the coal-bearing formations as well as more numerous coal seams.

Coal-bearing molasse of the Upper Silesian Coal Basin has been deposited in the external, eastern part of the arc of the Moravo-Silesian zone, corresponding to miogeosynclinal zone of the European Variscides. The Central-Bohemian Basin was situated within area of Variscan intramontane massif, and the Lower Silesian – in inner zone of the arc of the European Variscides.

LITERATURA

1. A u g u s t y n i a k K., G r o c h o l s k i A. – Geological structure and outline of the development of the Intra-Sudetic Depression. Biul. Inst. Geol. 1968 no. 227.
2. B a r a n o w s k i Z., H a y d u k i e w i c z A. – Aktualne kierunki badań stratygraficznych, sedymentologicznych i tektonicznych metamorfiku Gór Kaczawskich. Present directions of stratigraphic, sedymentologic and tectonic studies over the metamorphic zone of the Góry Kaczawskie (Mts), Engl. sum. Ibidem 1982 no. 341.
3. B e h r H.J., E n g e l W., F r a n k e W. – Variscian wildflysch and nappe tectonics in the Saxoturingian Zone (northeast Bavaria, West Germany). Am. Jour. of Sc. 1982 vol. 282 no. 9.
4. B e r e z o w s k i Z., C h o r o w s k a M. – Uwagi o utworach paleozoicznych na północ od Zgorzelca (Sudety Zachodnie). Remarks on the Paleozoic formations occurring north of Zgorzelec (West Sudetes). Engl. sum. Kwart. Geol. 1967 no. 4.
5. B i s k u p i n IG-1, Nowa Kuźnia IG-2, Chocianów IG-3 – in Polish only. Profile Głęb. Otw. Wiert. Inst. Geol. 1975 no. 23.
6. C h o r o w s k a M., S a w i c k i L. – O występowaniu zmetamorfizowanych utworów górnego dewonu i dolnego karbonu w Górach Kaczawskich. On the occurrence of metamorphozed Upper Devonian and Lower Carboniferous rocks in the Kaczawa Mountains. Engl. sum. Ibidem 1975 no. 2.
7. G ó r e c k a T. et all. – Utwory skalne podłoża permu zachodniej części monokliny przedsudeckiej i perykliny Żar oraz przyległej części bloku przedsudeckiego. The crystalline rocks and Carboniferous deposits of the Foresudetic Monocline, the Żary Pericline and the adjacent part of Foresudetic Block. Engl. sum. Sc. Pap. of the Inst. of Mining of Wrocław Techn. Univ. 1977 no. 9.
8. G ó r e c k a T. et all. – Utwory skalne podłoża permu wschodniej części monokliny przedsudeckiej. Pre-Permian rocks of eastern part of the Foresudetic Monocline. Engl. sum. Ibidem 1978 no. 11.
9. G r o c h o l s k i A. – Wulkanity niecki wałbrzyskiej w świetle badań strukturalnych. The volcanic rocks in the Wałbrzych trough in the light of structural studies. Engl. sum. Biul. Inst. Geol. 1965 no. 191.
10. G u n i a T. – Fauna, stratygrafia i warunki sedymentacyjne górnego dewonu depresji Świebodzic. On the fauna stratigraphy and conditions of sedimentation of the Upper Devonian in the Świebodzice Depression (Middle Sudetes), Engl. sum. Geol. Sudetica 1968 vol. 4.
11. K o t a s A. – Zarys budowy geologicznej Górnośląskiego Zagłębia Węglowego – in Polish only. Przew. 54 Zjazdu Pol. Tow. Geol. Wyd. Geol. 1982.
12. K u c h c i ń s k i J. – Podstawowe zagadnienia stratygrafii makroflorystycznej utworów karbońskich niecki śródsudeckiej. Main problems of macrofloristic stratigraph of the Intra-Sudetic Trough. Engl. sum. Prz. Geol. 1964 no. 7–8.
13. K u ł a k o w s k i T. – Wpływ warunków geologicznych na stopień metamorfozy węgli warstw żaclerskich w Dolnośląskim Zagłębiu Węglowym. Geological environments of coalification of the Žacler Beds in Lower Silesian Coal Basin. Engl. sum. Geol. Sudetica 1978 no. 2.
14. K w i e c i ń s k a B. – Graphite-like substance in natural coke from the Wałbrzych Basin (Lower Silesia). Pr. Miner. Komis. Nauk Miner. PAN Oddz. w Krakowie 1966 no. 5.
15. M i l e w i c z J. – Nowe dane o górnym karbonie w depresji północnosudeckiej. New facts about the Upper Carboniferous in the North-Sudetic Depression. Engl. sum. Biul. Inst. Geol. 1972 no. 259.
16. O b e r c J. – Budowa geologiczna Polski. T. 4 Tektonika, cz. 2 Sudety i obszary przyległe, in Polish only. Wyd. Geol. 1972.
17. O b e r c J. – Rozwój waryscydów południowej części strefy kaczawskiej. Evolution of the Variscides in the southern part of the Góry Kaczawskie (Mts) Zone. Engl. sum. Biul. Inst. Geol. 1982 no. 341.
18. T a s l e r et all. – Geologie české časti vnitrosudetké pánve. Geology of the Intra-Sudetic Basin. Engl. sum. 1979.
19. T e i s s e y r e H. – Stratigraphy and tectonics of the Świebodzice Depression. Biul. Inst. Geol. 1968 vol. 222.
20. T e i s s e y r e A.K. – Sedymentologia i petrografia kulmu starszego w zachodniej części niecki śródsudeckiej. Sedimentary and petrography of the Kulm of alluvial fans in the Western Intrasudetic Basin (central Sudetes – SW Poland). Engl. sum. Geol. Sudetica 1975 no. 2.
21. U n r u g R., D e m b o w s k i Z. – Rozwój diastroficzno-sedymentacyjny basenu morawsko-śląskiego. Diastrophic and sedimentary evolution of the Moravia-Silesia Basin. Engl. sum. Roczn. Pol. Tow. Geol. 1971 z. 1.
22. W a j s p r y c h B. – Allochtoniczne skały paleozoiczne w osadach wizeńskich Gór Bardzkich (Sudety). Allochtonous Paleozoic rocks in the Visean of the Bardzkie Mts (Sudetes). Engl. sum. Ibidem 1978 z. 1.
23. Ż a k o w a H. – Biostratygrafia utworów morskich dolnego karbonu z obszaru Wałbrzycha Miasta na Dolnym Śląsku. Biostratigraphy of the Lower Carboniferous marine deposits of the area of Wałbrzych Miasto (Lower Silesia). Pr. Inst. Geol. 1958 t. 19.

STRESZCZENIE

Utwory karbonu SW Polski wchodzą w skład poligenicznej struktury sudeckiej i strefy morawsko-śląskiej oraz jej północno-zachodniego przedłużenia w podłożu utworów permu i mezozoiku monokliny przedsudeckiej (por. ryc. 1). Struktura sudecka, w skład której wchodzą Sudety właściwe, blok przedsudecki i przyległa część monokliny przedsudeckiej, stanowi fragment wewnętrznego pasma waryscydów europejskich określanego jako strefa sudecko-sasko-turyngska lub szerzej jako strefa franko-czeska. Utwory strefy morawsko-śląskiej należą do zewnętrznego pasma waryscydów europejskich.

Karbon w granicach omawianego obszaru reprezentowany jest przez serie osadowe, wulkanity oraz intruzje granitoidów. Zróżnicowanie wieku, wykształcenia facjalnego i stopnia przeobrażenia utworów sąsiadujących ze sobą w strukturze sudeckiej wskazują na znaczne przemieszczenia poziome. Trwające jednocześnie ruchy pionowe doprowadziły w wizenie do powstania na terenie Sudetów Środkowych zapadliska śródgórskiego wypełnionego osadami typu molasowego, nie wykazującymi

deformacji typu fałdowego. W strefie okalającej strukturę sudecką tworzyły się w tym czasie osady asocjacji fliszowej a na pograniczu obu stref utwory typu olistostromów, zachowane dziś fragmentarycznie w strukturze kaczawskiej i bardzkiej.

Utwory węglonośne wchodzące w skład zapadliska Sudetów Środkowych określono jako molasę młodszą, która zdeponowana została w wewnętrznej strefie łuku waryscydów europejskich. W tabeli przedstawiono korelację jednostek litostratygraficznych silezu czeskiej i polskiej części zapadliska Sudetów Środkowych. Molasa węglonośna Górnośląskiego Zagłębia Węglowego zlokalizowana jest w strefie zewnętrznej łuku waryscyjskiego a środkowoczeskie zagłębia węglowe leżą w obrębie waryscyjskiego masywu śródgórskiego.

РЕЗЮМЕ

Карбонские отложения юго-западной Польши входят в состав полигенической судетской структуры и моравско-силезской зоны, а также её северо-западного продолжения в основе пермских и мезозойских осадков Предсудетской моноклинали (рис 1). Судетская структура, в состав которой входят собственно Судеты, предсудетский блок и прилегающая часть Предсудетской моноклинали, составляет собой фрагмент внутренней цепи европейских варисцидов, определяемой как судетско-саско-турингская зона, или шире — как франко-чешская зона. Отложения моравско-силезской зоны принадлежат к внешней цепи европейских варисцидов.

Карбон в пределах рассматриваемого района представлен осадками, вулканитами и интрузиями гранитоидов. Разность возраста, фациального представления и степени преображения отложений соседующих с собой в судетской структуре, указывают на большое горизонтальное перемещение. Происходящие одновременно вертикальные движения вызвали образование в визейском ярусе в центральных Судетах межгорного прогиба заполненного осадками типа молассы, не нарушенными складчатостью. В зоне окружающей судетскую структуру образовались в это время осадки флишевой ассоциации, а на грани этих зон — осадки типа олистостромов, которых фрагменты сохранились до сих пор в качавской и бардской структурах.

Угленосные отложения входящие в состав прогиба центральных Судетов причислены к младшей молассе, осажденной во внутренней зоне дуги европейских варисцидов. В таблице 1 представлена корреляция литостратиграфических единиц силеза чешской и польской частей прогиба Центральных Судетов. Угленосная моласса Верхнесилезского угольного бассейна находится во внешней зоне варисцийской дуги, а центральночещские угольные бассейны расположены в пределах варисцийского межгорного массива.