JACEK ROBERT KASIŃSKI

Instytut Geologiczny

SEDIMENTARY MODELS OF SMALL LIGNITE DEPOSITS: EXAMPLES FROM THE POLISH NEOGENE

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INTRODUCTION

Geological data, collected during extensive investigations of shallow-seated lignite deposits, appear very useful to construct the sedimentary environment models of the lignite formation. These data concern to small geological structures considerably variegated from genetic point of view. They usually have got the distinctly marked borders. The shallow-seated lignite deposits were prospected in the close drilling network with the modulus 50–200 m. The main part of the boreholes obtained the bottom surface of the lignite formation. Small extension of the geological forms allowed also to analyse of the complete accessible material relatively easy.

However, utilization of the described data was not deprived of the considerable troubles. The most important of them was an impossibility to make compare the data from the boreholes with the from outcrops, because there are not any convenient outcrops in the all studied shallow-seated lignite basins. The second trouble was a bad preservation of the sedimentary structures in the loose material from the drilling core. These difficulties made practically impossible to do the analysis of the sedimentary structures and made non-unisignificate the sedimentary cyclicity interpretation in the part concerning to the analysis of cycle types. Nevertheless, comparatively examination led in the outcrops in the another sedimentary basins (42, 30, 31, 44) allowed to assign the essential sedimentary features possible to observation in borehole profiles (as thickness relations between the individual members and their succession in a sedimentary sequence) to define the lithofacies and sublithofacies and, consequently, dynamofacies in the sedimentary environment.

In this paper three various models of the lignite formation sedimentary environment are presented. They are prepared on a basis of three different-type lignite deposits (Fig. 1): paralic, lagoonal-deltaic environment (Trzydnik deposit), intramontane basin environment (Siedlimowice deposit) and fluviatile environment (Wola Owadowska–Jastrzębia deposit).

METHODS OF STUDY

Taking into consideration the geological data character the author used two basic analytical methods to study of the lignite formation:

– lithofacial analysis (21) based on cartometric data (basement surface map, lignite formation thickness map, summary clastic members thickness map and map of the lithological elements quantitative relations);

– analysis of the sedimentary cyclicity applicating the embedded Markov chains (22, 37, 39), completed by the analysis of the sedimentary sequences frequency.

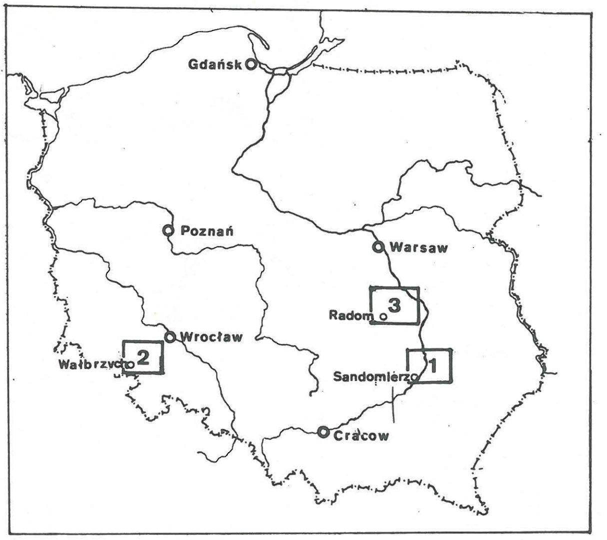

Fig. 1. Localization map of the described sedimentary basins.

S – Sandomierz vicinity (Trzydnik deposit), 2 – Wałbrzych vicinity (Siedlimowice deposit), 3 – Radom vicinity (Wola Owadowska–Jastrzębia deposit).

Ryc. 1. Mapa lokalizacyjna omawianych basenów sedymentacyjnych

1 – okolice Sandomierza (złoże Trzydnik), 2 – okolice Wałbrzycha (złoże Siedlimowice), 3 – okolice Radomia (złoże Wola Owadowska–Jastrzębia).

Lithofacial analysis of the lignite formation made possible to draw the conclusions concerning to the basement tectonics and its influence on sedimentary processes and, also, variability of the sedimentary conditions.

Markov analysis entirely based on data from the drillings, partially archival. The differences of the description of the borehole cores were not substantial with statistical regards in spite of the descriptions had been prepared by several authors. Comparisional study of the Markov analysis application based on more differentiated data (from the description made in mining terminology and complete sedimentological description) did not showed substantial differences in the result (38).

Peculiar applicability of the Markov analysis to the study of the sedimentary cyclicity in coal-bearing formations was confirmed many times (16, 2, 10, 11, 45, 40, 31, 48). The analysis usually based on two-dimensional matrices (22):

– independent trials matrix e_{ij},

– transition count matrix f_{ij},

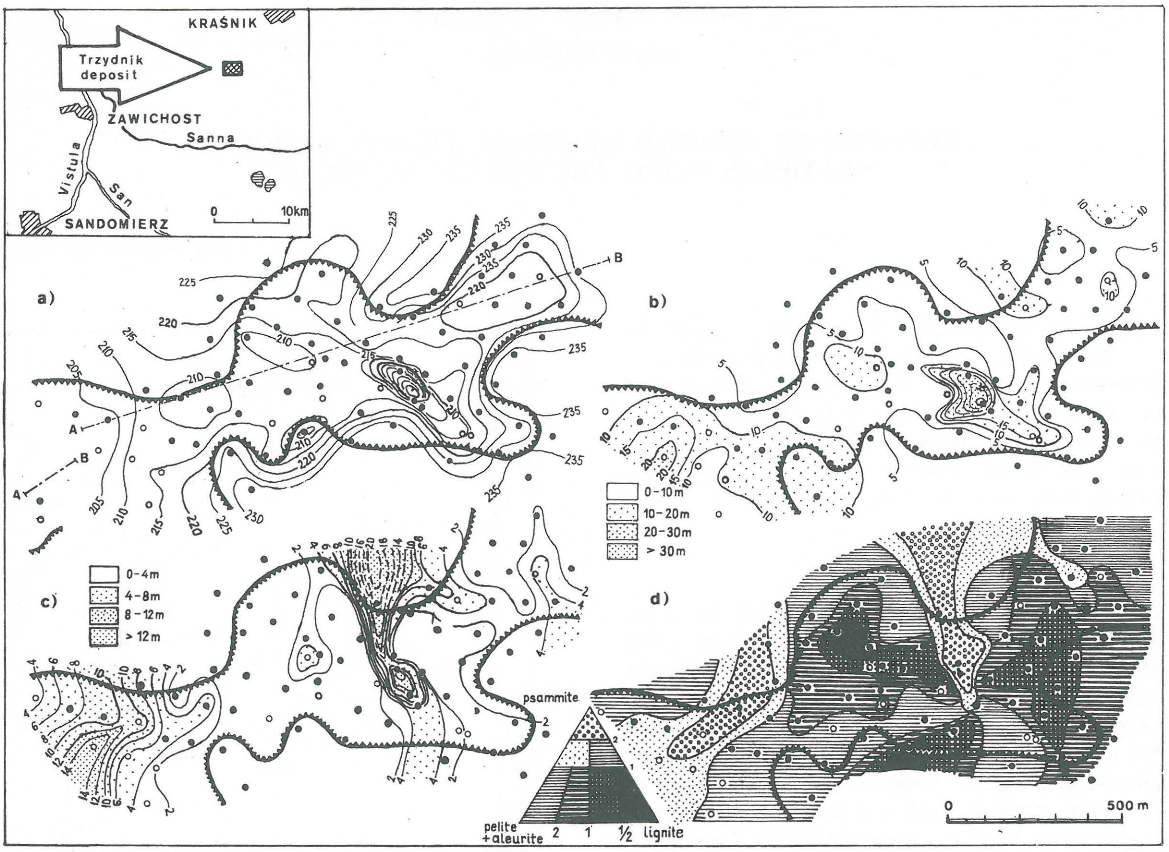

Fig. 2. Trzydnik Basin. Structural and lithofacial maps.

a – surface of the lignite formation basement, b – thickness of lignite formation, c – summary thickness of clastic sediments, d – thickness relations;
1 – borehole cutting through the lignite formation, 2 – borehole stopped into lignite formation, 3 – recent erosional boundary of lignite-bearing deposits.

Ryc. 2. Basen Trzydnika. Mapy strukturalne i litofacjalne.

a – morfologia podłoża formacji brunatnowęglowej, b – miąższość formacji brunatnowęglowej, c – sumaryczna miąższość osadów klastycznych, d – mapa litofacjalna stosunków miąższościowych.

1 – otwory wiertnicze, przebijające formację brunatnowęglową, 2 – otwory wiertnicze, zatrzymane w osadach formacji brunatnowęglowej, 3 – współczesna granica erozyjna osadów węglonośnych.

– transition probability matrix p_{ij},
– difference matrix d_{ij}.

Every matrix element represented number of the transition every rock type from the verse to the adequate rock type in the column. Number of the counted transitions was suitable 501, 376 and 596 in the studied areas. It is entirely sufficient in order to receive statistically substantial results (37, 39). The difference matrix was counted as a difference between the transition probability matrix and the independent trial matrix:

$$d_{ij} = p_{ij} - e_{ij}$$

The elements of this matrix which were moreover zero represented transitions with the probability moreover casual (Figs. 4 and 9).

Every difference matrix was tested as a whole by χ^2 test (5) according to the function:

$$\chi^2_v = \sum_{ij}^{n} \frac{(f_{ij} - f_i e_{ij})^2}{f_i e_{ij}}$$

where:

f_i – frequency distribution of the rock types,
n – matrix dimension,
v – degree of freedom.

Computed value of the χ^2 many times exceeded the critical value on the trust level 95 per cent in every case. Therefore, an occurrence of the examinated sedimentary sequences was not accidental in any case and the Markov process appeared here in everytime.

The author specificated three groups of the cyclic sedimentary sequences for the analysis of the frequency:

– simple, upward fining cycles, interpretated as the sequences of the meandering rivers and alluvial fans;
– "symmetrical" cycles, interpretated as lagoonal-swamp, lacustrine and alluvial plain sequences;
– reversed cycles, interpretated as lagoon-barrier, deltaic and crevasse splay sequences.

Genetic interpretation of the first two groups was relatively easy. In the case of the upward fining cycles the high repetition in the geological profile was an important feature. The discrimination between lagoonal-swamp cycles and alluvial plain (lacustrine) sequences was done basing on marly intercalations presence. Genetic interpretation of the reversed cycles was more difficult. The author took into consideration there a lithofacial and paleogeographical position of the sediments and analogies with the sedimentary sequences from another coal basins (1, 20, 25, 19, 28, 31, 44, 46). Thickness of the clastic members in a sedimentary sequence had the fundamental significance for the crevasse splay sequences interpretation (2, 43).

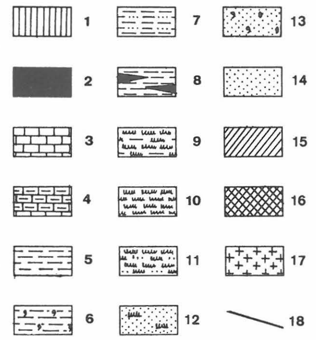

Fig. 3. Explanations of sedimentary cycle profiles and block-diagrams of sedimentary environments.

Lithological types: A – gravely sand, B – sand, C – coaly sand, D – silt, E – coaly silt, F – clay, G – coaly clay, H – lignite, I – marly clay, J – marl, K – lithothamnium limestone;

1 – Quarternary deposits; Neogene: 2 – lignite, 3 – lithothamnium limestone, 4 – marl and marly clay, 5 – clay, 6 – coaly clay, 7 – sandy clay, 8 – clay with lignite intercalations, 9 – clayey silt, 10 – silt, 11 – sandy silt, 12 – silty sand, 13 – coaly sand, 14 – sand and gravely sand; 15 – Oligocene deposits; 16 – Upper Cretaceous deposits, 17 – Paleozoic (Precambrian) metamorphie rocks, 18 – faults.

Sedimentary sequence types: 1 – barrier-lagoon, 2 – lagoonal-swamp, 3 – deltaic, 4 – meandering rivers, 5 – crevasse splay, 6 – alluvial (fluvial) plain, 7 – alluvial fan, 8 – channel (reduced sequence of meandering rivers).

Sedimentary environments: a – lagoon, b – barrier front, c – barrier proper, d – overgrown parts of lagoon, e – prodelta, f – delta front, g – distributary channels, h – meander bar, i – stable outwashes, levees, crevasses, j – alluvial plain, k – swamp on alluvial plain, l – distal part of crevasse splay; m – distributary part of crevasse splay; n – alluvial fan; o – surfacing flow on alluvial fan.

Ryc. 3. Objaśnienia profili cykli sedymentacyjnych i blokdiagramów środowisk sedymentacyjnych.

Wydzielenia litologiczne: A – piaski ze żwirem, B – piaski, C – piaski węgliste, D – mułki, E – mułki węgliste, F – iły, G – iły węgliste, H – węgle brunatne, I – iły margliste, J – margle, K – wapienie litotamniowe.

1 – osady czwartorzędowe; neogen: 2 – węgiel brunatny, 3 – wapień litotamniowy, 4 – margiel i ił marglisty, 5 – ił, 6 – ił węglisty 7 – ił piaszczysty, 8 – ił z przewarstwieniami węgla brunatnego, 9 – mułek ilasty, 10 – mułek, 11 – mułek piaszczysty, 12 – piasek mułkowaty, 13 – piasek węglisty, 14 – piasek i piasek ze żwirem; 15 – osady oligocenu; 16 – osady kredy górnej; 17 – skały metamorficzne paleozoiku (prekambru?); 18 – uskoki.

Typy sekwencji sedymentologicznych: 1 – barierowo-lagunowa; 2 – lagunowo-bagienna; 3 – deltowa; 4 – rzek meandrujących; 5 – glifów krewasowych; 6 – równi zalewowej; 7 – stożków napływowych; 8 – korytowa (zredukowana sekwencja rzek meandrujących).

Środowiska sedymentacyjne: a) laguna; b) czoło bariery; c) bariera właściwa; d) zarastająca laguna, bagno; e) prodelta; f) czoło delty; g) koryta rozprowadzające; h) odsypy meandrowe, i) odsypy nieruchome, wały brzegowe, glify krewasowe; j) równia zalewowa; k) bagna na równi zalewowej; l) część dystalna glifu krewasowego; m) część „rozprowadzająca" glifu krewasowego; n) stożek napływowy; o) zalewy powierzchniowe stożka napływowego.

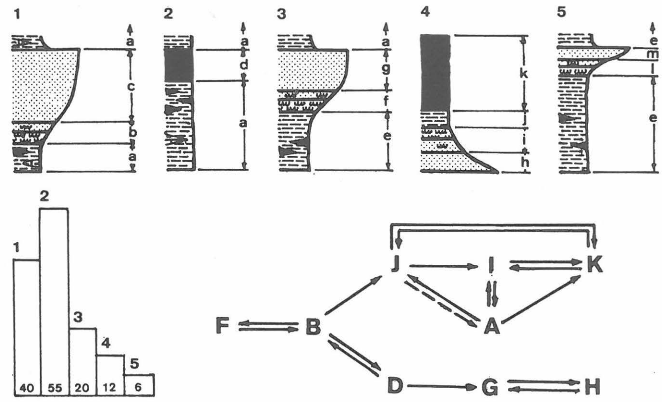

Fig. 4. Trzydnik Basin. Types of the cyclic sequences, their distribution and Markov model. Explanations as on the fig. 3.

Ryc. 4. Basen Trzydnika. Typy sekwencji sedymentacyjnych, częstotliwość ich występowania i model Markova. Objaśnienia jak na ryc. 3.

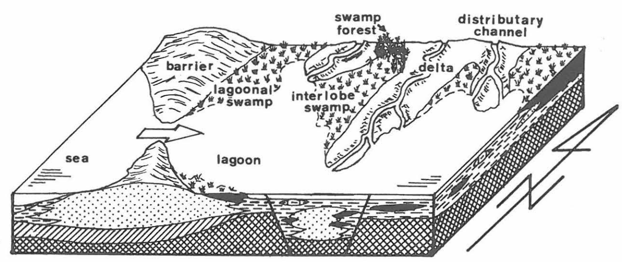

Fig. 5. Trzydnik Basin. Model of lignite formation sedimentary environment. Explanations as on the fig. 3.

Ryc. 5. Model środowiska sedymentacji formacji brunatnowęglowej w basenie Trzydnika. Objaśnienia jak na fig. 3.

TRZYDNIK DEPOSIT

Trzydnik deposit is situated in the border zone between Roztocze and Sandomierz Depression and belongs to the western slope of the Lvov–Lublin Trough near the eastern boundary of the paleozoic platform. During the sedimentation of the lignite formation the sedimentary basin was placed in the marginal zone of the Tertiary sea filling the fore-Carpathian Depression. The Tertiary lignite formation lies partially on the Upper Cretaceous marine deposits and partially on Oligocene, also developed in marine facies. The lignite-bearing sediments occupied the place in the lower part of the Miocene profile represented by Badenian and Sarmatian deposits (35, 15, 4, 9).

The lowermost part of the sequence belongs, may be, to the upper part of the Carpathian (14, 34). As the upper boundary of the studied series author has admitted the bottom surface of the carbonate formation reckoned as Lower Badenian (36). Lithothamnium limestone, marl and marly clay compose the carbonate formation profile covering the lignite formation. Deposition of this formation was connected with the regional change of the sedimentary conditions being the result of Lower Badenian transgression. Recent borders of the lignite formation occurrence are an effect of the Upper Sarmatian and later erosion. The recent basin shape do not corresponds to the primary one.

Basement surface of the lignite formation is rather

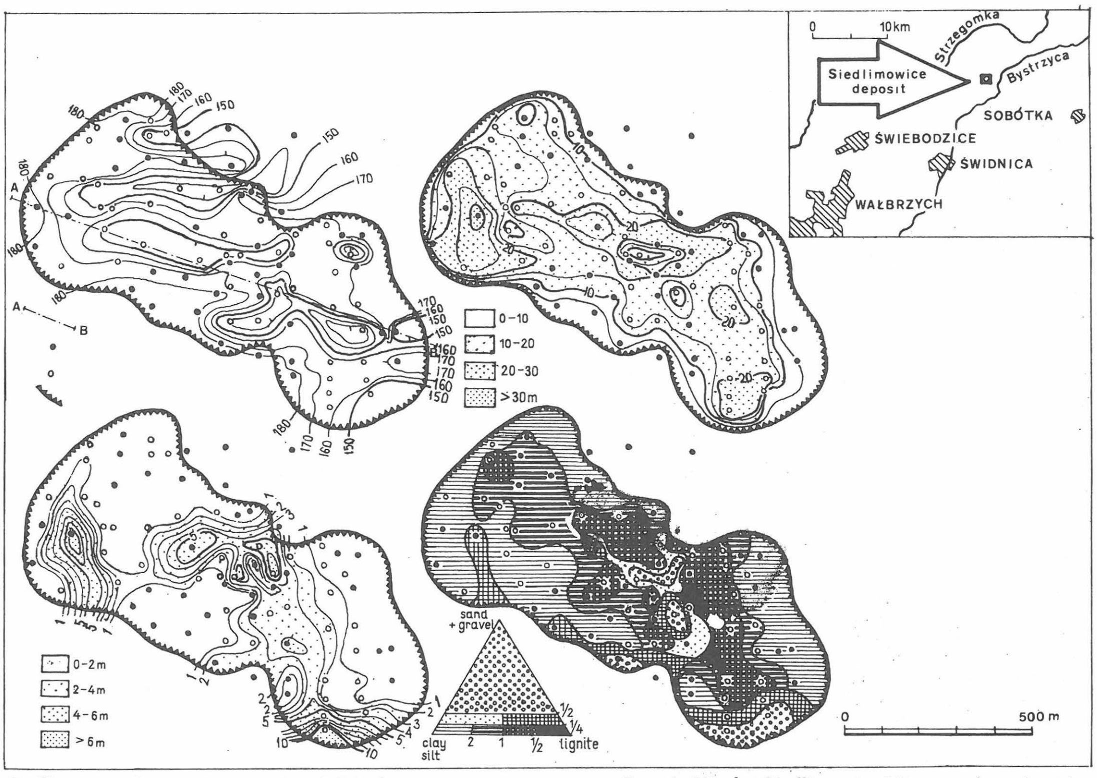

Fig. 6. Siedlimowice Basin. Structural and lithofacial maps:

a – surface of the lignite formation basement; b – thickness of lignite formation; c – summary thickness of clastic sediments; d – thickness relations;

1 – borehole cutting through the lignite formation; 2 – borehole stopped into lignite formation; 3 – sedimentary boundary of lignite formation.

Ryc. 6. Niecka Siedlimowic. Mapy strukturalne i litofacjalne.

a – morfologia podłoża formacji brunatnowęglowej; b – miąższość formacji brunatnowęglowej; c – sumaryczna miąższość osadów klastycznych; d – mapa litofacjalna stosunków miąższościowych;

1 – otwory wiertnicze, przebijające formację brunatnowęglową; 2 – otwory wiertnicze, zatrzymane w osadach formacji brunatnowęglowej; 3 – sedymentacyjna granica występowania formacji brunatnowęglowej.

even. Only in the basin central part the considerable lowering is visible (Fig. 2a). Thickness of the lignite formation increases at the same place (Fig. 2b). Two big clastic lithosomes occur in the sedimentary basin area: the longitudinal lithosome orientated SSW–NNE in the western part and the tripartite lithosome orientated meridianelly in the central part (Fig. 2c–d). The western one is vertically developed in the whole lignite formation profile and the second one – only in the uppermost part of the profile. Clayey and phytogenic lithofacies fill the remain part of the basin. More clastic lithofacies predominate in the basin marginal zone and more caustobiolithic – in the basin centre (Fig. 2d). Phytogenic deposits are composed by lignite (in the main part detrital type) and coaly clay.

The Markov analysis was done on the basis of geological data from the complete Lower Badenian profile including the carbonate formation. The author set appart nine individual lithological types (*vide* Fig. 3): gravel and gravely sand, sand, silt, clay, coaly clay, lignite, marly clay, marl and lithothamnium limestone.

There are arised the sedimentation processed had got a heterogenous character there. Radiation of the Markov chain to three branches proves about this character. Differentiation between the sedimentary sequences (Fig. 4) confirm the conclusion presented above. Lagoonal-swamp and barrier-lagoon cycles have predominated in the lignite formation profile (total 71,4%) and deltaic cycles have occupied the second place with regard to occurrence iteration (15,0%).

The data presented above made possible to construct of the sedimentary basin model (Fig. 5). During the time of the sedimentation the basin was probably a shallow lagoon on its western margin partially separated from the open sea by a sandy barrier. In the first stage the clayey sedimentation predominated in the all basin area and later an accumulation of phytogenic matter took a bigger and bigger part in the basin centre. The rich delivery of a clayey matter probably repressed a swamp flora development in the basin margin: clayey and coaly-clayey lithofacies occurred there. In the central part of the sedimentary basin developed above all reed moors and their sediments took a main part in the deposition. The swamps grown by a swamp forest occurred sporadically.

The second stage of the sedimentary basin evolution was connected with the development of the small delta. The delta entered to the lagoon with three lobes from North to South. The intensive peat accumulation (predominantly reed-type all the time) persisted between the delta lobes. The biggest pressure of the central lobe induced the subsidence of the depositional surface there. This process made possible the sedimentation of the thick clastic series.

Mechanism of the cyclic sedimentation had autocyclic character (3) in the Trzydnik basin. There were three main kinds of sedimentary processes controlling the origin of the cyclic sequences: periodical contact between the lagoon and the open sea, hesitations of the delivery of the clay and fine-grained matter to the basin and lateral

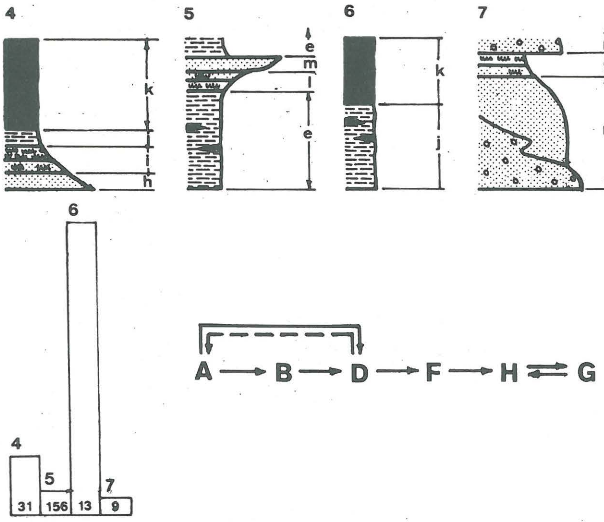

Fig. 7. Siedlimowice Basin. Types of the cycles sequences, their distribution and Markov model. Explanations as on fig. 3.

Ryc. 7. Niecka Siedlimowic. Typy sekwencji sedymentacyjnych, częstotliwość ich występowania i model Markova. Objaśnienia jak na fig. 3.

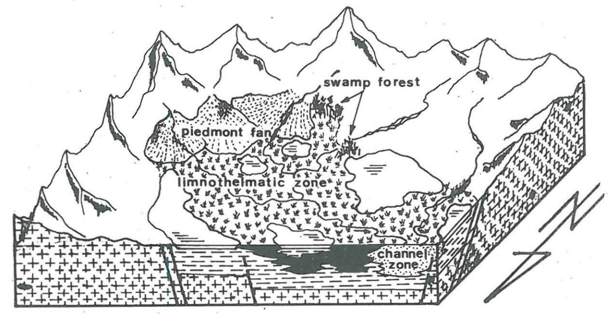

Fig. 8. Siedlimowice Basin. Model of lignite formation sedimentary environment. Explanations as on the fig. 3.

Ryc. 8. Model środowiska sedymentacji formacji brunatnowęglowej w basenie Siedlimowic. Objaśnienia jak na ryc. 3.

migration of the distributary channels on the surface of the delta lobes.

SIEDLIMOWICE DEPOSIT

Siedlimowice deposit is situated on the Sudetic foreland in the zone of the NE metamorphic cover of the granitoidal massif Strzegom – Sobótka. Basement of the lignite formation appears as mica-shales, weathered in the different degree. The age of these rocks is discussed: some authors have classified these ones to Precambrian (41) and the another ones to Early Paleozoic (after L. Sawicki, 47, Ordovician). The lignite formation occurs there only in all the Tertiary profile. This formation deposits fill a small tectonic trough. Fluviatile erosion transformed probably the bottom of this trough (17). The age of the lignite-bearing deposits was defined as Miocene, but their uppermost part could belong to Pliocene (49).

In the neighbouring areas, where Tertiary deposits are developed more completely, the Upper Oligocene deposits begin the Tertiary profile (29). It shows the connection between the beginning of the sedimentation and the post-Laramie stage of the tectonic relaxation. This connection is distinctly visible in the all Sudetes and paleozoic platform area (32).

The lignite formation is covered by 0,3 – 11,0 m thick Quarternary series (17).

The basin bottom surface is very differentiated: several longitudinal depressions and elevations are visible there. All of these are orientated paralelly. The bottom surface is mostly lowered in the southernmost part of the basin (Fig. 6a), but the lignite formation obtains the most thickness in the central part of the trough (Fig. 7b). Sandy lithosomes, relatively thin, are placed along southern and western frames of the basin in the lower part of the geological profile (Fig. 6c – d). The little more thick clastic lithosome orientated meridianelly is situated in the basin centre in the upper part of the Tertiary profile. In the whole basin area clayey and phytogenic lithofacies predominate distinctly. Lignite and coaly-clayey lithosomes take a main part in the basin centre, like in the Trzydnik basin. Phytogenic deposits consist of detrital lignite and clayey lignite with continuous transitions to coaly clay. Sometimes silty- and sandy lignite occur there. Xylitic-detrital lignite occurs rarely (17).

The Markov analysis was done on the basis of six lithological elements (*vide* Fig. 3): gravel and gravely sand, sand, silt, clay, coaly clay and lignite.

There are arised the sedimentation process had got almost homogenous character there. Analysis of the sedimentary sequences distribution confirmed this conclusion: the cyclic sequences were very little differentiated. Lacustrine and alluvial plain deposits predominated in the all basin area obtaining 74,6% of the total number of the sequences. Another kinds of the sequences occurred secondarily: meandering river cycles obtained 14,8%, crevasse splay cycles – 6,2% and alluvial fan cycles – 4,3%.

The data presented above made possible to construct the next model of the sedimentary basin (Fig. 7). All the deposits filling the tectonic trough were origined during the single sedimentary megacycle, evoked by the paroxism of the basin bottom gravitational subsidence. Tectonic movements were probably most intensive at the beginning of the paroxism and, subsequently, went out gradually similar to another Western Poland tectonic depressions (32). The high hydraulic gradient was a first cause of the clastic sedimentation development in the southern and western basin margins. The piedmont fan was originated there. In the remain part of the basin the relatively deep intramontane lake developed in the first stage of the sedimentation. Deepness of the lake made impossible the vegetation of the peat flora, therefore clayey sedimentation predominated in the basin centre that time. The conditions convenient for this phytocoenosis development and peat accumulation occured in the basin central part not till then its partial filling in the final stage of the sedimentation. The low rate of the subsidence during that period allowed to balance the rate of the lowering of the depositional surface with the rate of phytogenic matter accumulation and deposition of thick peat series (8). Recently thickness of the lignite seam obtains 12,0 m (17). Peat flora was represented mainly by the reed-moor phytocoenosis and the swamp forest appeared sporadically.

During the last stage of the basin development an influence of the fluviatile sedimentation is visible along the basin short axis. Rather narrow meander belt was a result of the small river activity, what flowed from South to North. Lowering of the depositional surface in the basin centre made possible the further development of

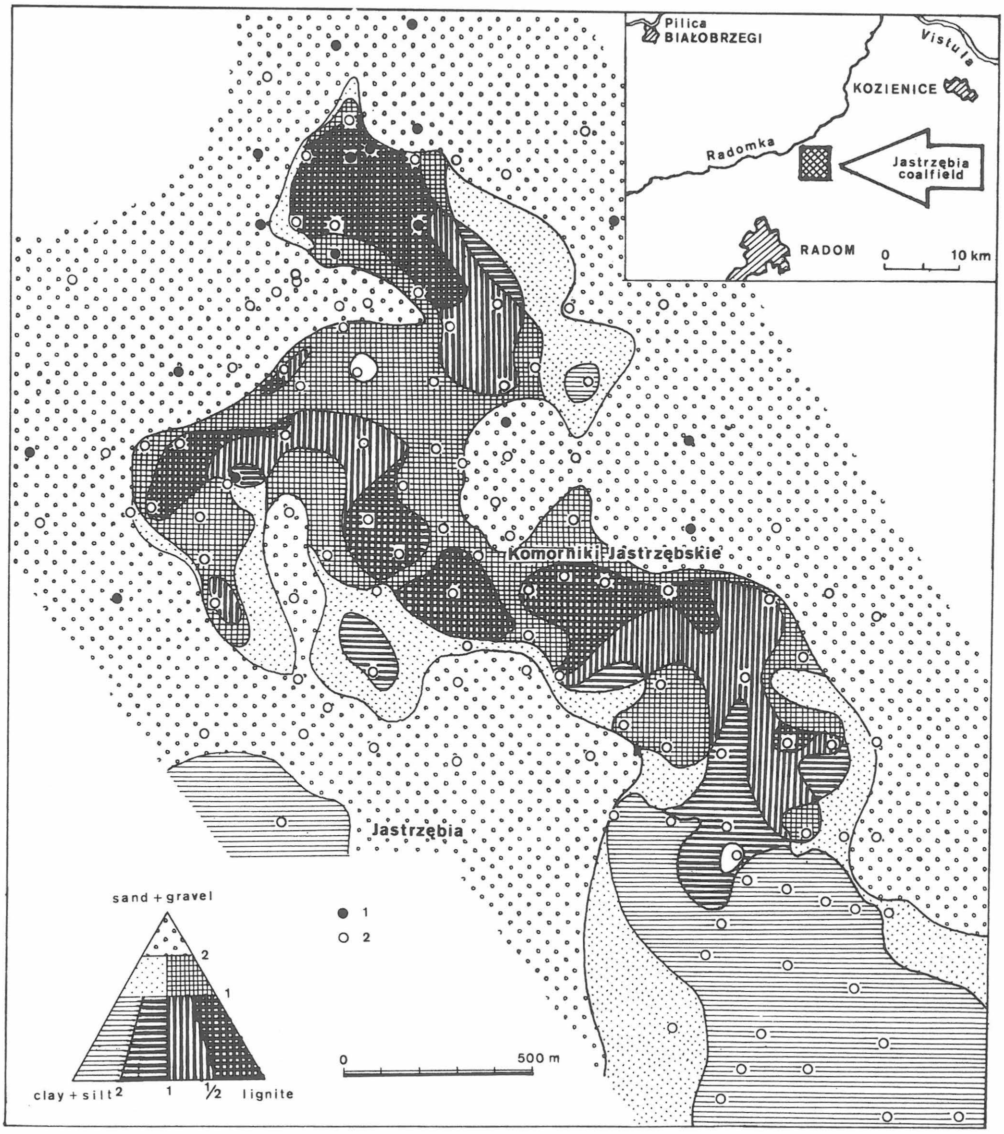

Fig. 9. Jastrzębia coalfield. Lithofacial map of thickness relations. Types of the lithofacies after the classification triangle;

1 – borehole cutting through the lignite formation; 2 – borehole stopped into lignite formation.

Ryc. 9. Pole Jastrzębia. Mapa litofacjalna stosunków miąższościowych. Rodzaje wydzielonych litofacji według trójkąta klasyfikacyjnego.

1 – otwory wiertnicze, przebijające formację brunatnowęglową; 2 – otwory wiertnicze, zatrzymane w osadach formacji brunatnowęglowej.

this structure. The lowering was probably connected with compaction of the phytogenic sediments. Accepting the compaction coefficient no more than 1,6 – 1,9 (27) for recent thickness of the lignite seam and the overburden (17). The subsidence could obtain the value 4,5 – 5,7 m and, certainly, had to pass gradually. The fluviatile sedimentation was also connected with erosion of the clayey and lignite sediments earlier deponded.

In the Siedlimowice basin allocyclic mechanism (tectonic gravitational movement and compaction of the phytogenic sediments) played a main part determining the sedimentary cyclicity. The kind of cyclicity observed there is typical for tectonic depression in Western Poland (32). Effects of the autocyclic mechanism activity, evoked by the river channel migration on the alluvial plain (3), superposed on the results of the allocyclic mechanisms activity only in the uppermost part of the profile. With regard to high subsidence rate the meander belt sediments are recently preserved in the individual clastic lenses form.

WOLA OWADOWSKA – JASTRZĘBIA DEPOSIT

Wola Owadowska – Jastrzębia deposit is situated in the marginal part of the paleozoic platform near its eastern boundary, on the western slope of the Lvov – Lublin Depression. Basement of the lignite formation consist of the Oligocene marine deposits and the overburden of this one – thin series of the Quaternary glacial deposits. The age of the lignite formation is defined as Upper Miocene (50).

The western part of the deposit – Jastrzębia coalfield – was a subject of detail investigations. With regard to relatively little number of boreholes which obtained the lignite formation basement, the author gave up to make of the basement surface map and the total formation thickness map in this case. However, the boreholes cut through the most part of the Miocene profile. This situation allowed to prepare the clastic summary thickness map and the thickness relations map (Fig. 9), burdened not all to big error.

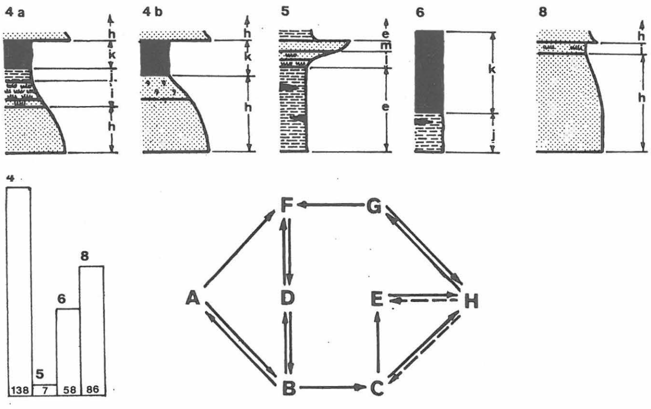

Fig. 10. Jastrzębia Basin. Types of the cyclic sequences, their distribution and Markov model. Explanations as on the fig. 3.

Ryc. 10. Basen Jastrzębi. Typy sekwencji sedymentacyjnych, częstotliwość ich występowania i model Markova. Objaśnienia jak na ryc. 3.

Clastic lithosomes predominated in almost whole Jastrzębia coalfield, excluding two small areas at SE and SW (Fig. 9). Small longitudinal clayey-lignite lithosomes, sometimes relatively thick, occur among the clastic deposits. In these lithosomes the detrital lignite predominate. The coaly sand and silt occur frequently too. The xylitic lignite occurs as thin intercalations only and it has a little lateral extension.

The Markov analysis was limited to the lignite formation profile only and prepared on a basis of eight lithological types (*vide* Fig. 3): gravely sand, sand, coaly sand, silt, coaly silt, clay, coaly clay, lignite.

There are arised the sedimentation processes had rather homogenous character there, although the individual sedimentary cycles were frequently not completed and, sometimes, reduced to the lowermost members. Simple cycles of meandering rivers predominated among sedimentary (Fig. 10). Together with reduced cycles they did 77,5% of the total cycle number. "Symmetrical" cycles of the alluvial plain are frequent enough (20,1%). A number of reversed cycles interpretated as crevasse splay sequences is distinctly lower – 2,4%.

All the sedimentary series filling the basin was an effect of the big river activity. The direction of the river flow was conformable with the basin long axis. This series was deponed as meander belt clastic sediments. Relatively big lobes of the upper part of the meandering river sequence were preserved at the SW i SE part of the basin. These ones were probably sediments of the local lakes on the alluvial plain. The accumulation of phytogenic matter persisted simultaneously in the widespread swamp area (in a main part reed-type) in the all sedimentary basin (Fig. 11). A swamp forest overgrew only small parts of the basin. However, recently the alluvial plain sediments have got only relic character. The most part of them was destroyed by the erosion of the migrating channels. This process occurring in the slow slow subsidence conditions was extorted by pressure of the accumulated sediments only and, therefore, was an effect of the autocyclic mechanism activity (3). The intensive erosion alluvial plain deposits explain the occurrence of the big clastic lithosomes widespreaded laterally.

RECAPITULATION

Small sedimentary basins with the distinctly defined boundaries can be excellent model areas for reconstruc-

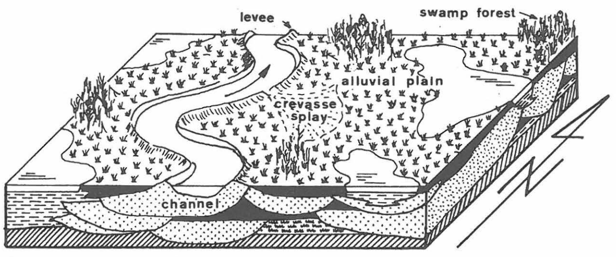

Fig. 11. Jastrzębia Basin. Model of lignite formation sedimentary environment. Explanations as on the fig. 3.

Ryc. 11. Model środowiska sedymentacji formacji brunatnowęglowej w basenie Jastrzębi. Objaśnienia jak na ryc. 3.

tion of the lignite formation sedimentary environment. The sedimentary models prepared on this basis with the different origin proves applicable also to description of the another scale sedimentary basin. The comparison with the data from the great lignite basins as the Zittau Basin (42, 30, 33), Bersdorf–Radomierzyce Basin (31, 13), Lower Rhine Basin (21, 22, 19, 20, 26, 6, 7) and another ones (18, 46) allows to confirm practically the same sedimentary features in the models presented in this paper. For the reason of relatively easy construction way the models prepared on a basis of small sedimentary basin can be useful as the more universal tool.

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STRESZCZENIE

Program badań płytkich złóż węgla brunatnego pozwolił na dokładne poznanie budowy szeregu niewielkich, zazwyczaj wyraźnie wyodrębnionych basenów sedymentacyjnych neogeńskiej formacji brunatnowęglowej. Zgromadzone dane geologiczne umożliwiły dokonanie rekonstrukcji środowiska sedymentacji w wybranych basenach. Rekonstrukcję tę przeprowadzono dla trzech basenów o odmiennej genezie: basenu paralicznego o sedymentacji typu bariero-wo-lagunowego (Trzydnik), basenu typu niecki śródgórskiej (Siedlimowice) i basenu zdominowanego przez sedymentację fluwialną (Jastrzębia).

Dla każdego z opracowywanych basenów wykonano zestaw map strukturalnych i litofacjalnych (mapy morfologii podłoża, mapy miąższościowe, mapy sumarycznej miąższości osadów klastycznych i mapy stosunków miąższościowych). Na podstawie materiału wiertniczego przeanalizowano typy sekwencji sedymentacyjnych i częstotliwość ich występowania oraz wykonano analizę cykliczności sedymentacji metodą szeregów włożonych Markowa. Prace te posłużyły do opracowania modelu środowiska sedymentacji dla każdego z omawianych basenów.

Porównując wyniki prac z modelami opracowanymi wcześniej dla rozległych trzeciorzędowych basenów brunatnowęglowych stwierdzono, że oba typy modeli wykazują daleko sięgające podobieństwo w przypadku podobnej genezy basenów. Modele opracowywane dla małych basenów sedymentacyjnych mogą zatem mieć duże znaczenie jako materiał porównawczy i stanowić narzędzie bardziej uniwersalne, przydatne także do badań struktur o znacznie większej skali.