acta
geologica
polonica

Vol. 30, No. 4 Warszawa 1980

MACIEJ HAKENBERG

Dependence of the thickness of Permian to Jurassic sediments in the Miechów Basin on major faults

ABSTRACT: The thickness of sediments including those of the Permian to the Jurassic increases in the Miechów Basin from the Silesian-Cracovian monocline towards the Holy Cross Mts and the Radomsko elevation. On the whole the trend of isopachytes is sub-equatorial (WNW—ESE) i.e. following that of the Palaeozoic structures in the Holy Cross Mts and in the substratum of the Miechów Basin, including the major longitudinal dislocations of the Holy Cross Mts, Zbrza and Książ Wielki. The current opinion is that the Holy Cross dislocation separates the Łysogóra and the Kielce region which differ in their palaeogeographic and palaeotectonic development. The present writer believes that a similar role is played by the Zbrza dislocation in relation to the region of Kielce and to the newly differentiated region of Jędrzejów whose southern boundary is limited by the Książ Wielki dislocation. The three regions here mentioned are characterised by the gradually S—N decreasing thickness of deposits, both in the Palaeozoic and the Mesozoic.

INTRODUCTORY REMARKS

The initial analytic material for the preparation of this paper has been provided by works already published (Jawor 1970, Moryc 1971, Konior 1974, Jurkiewicz 1974, 1975, Doktorowicz-Hrebnicki & S. Z. Różycki 1949, Czarnocki 1953, J. Jurkiewicz, F. Różycki & S. Z. Różycki 1954, Osika & al. 1972) and by the archival material of the Geological Institute CUG and the Institute of Geological Sciences PAN (borehole sketch maps and papers by Jurkiewicz 1966—1971, Jurkiewicz & Szczerba 1976, Giżejewska 1977, Kutek & Wierzbowski 1977, Zawidzka 1977, Morawska 1978 and Hakenberg 1977). Archival seismic documentation has also proved useful (Przybyło 1964, Klucznik, Gorniak & Borgurdowicz 1967, Klucznik & Gorniak 1968).

Table 1

Specification of boreholes and of the thickneess of the pierced Permian and Mesozoic (without Cretaceus) deposits

Name, number and abbreviated name of borehole	Thickness (m)	Name, number and abbreviated name of borehole	Thickness (m)	Name, number and abbreviated name of borehole	Thickness (m)
Batowice *1* B 1	231	Kobylniki *1* Ko 1	1025	Radłów *5* Ra 5	<730
Biadoliny *9* Bia 9	711	Koniusza *1* Kn 1	463	Radoszyce *3* Rado 3	
Biadoliny *11* Bia 11	653	Książ Wielki *IG-1* KsW 1	885	Radwanów *IG-1* Rad 1	
Biała Wielka *IG-1* BiW 1	1324	Kwików *1* Kwi 1	542	Radzanów *2* R 2	1865
Boża Wola *IG-1* BW 1	1803	Lepuszna *1* Lep 1	370	Radzanów *4* R 4	1137
Brzegi *IG-1* Br 1	1903	Leszczyna *1* Leszcz 1	>455	Rudno *1* Ru 1	458
Brzesko *1* Brzes 1	493	Leszczyna *4* Leszcz 4	>389	Rzeki *1* Rze 1	~1427
Brzeźnica *1* Brz 1	469	Liplas *2* Lip 2	>1770	Rzeszotary *2* Rz 2	>95
Brzeźnica *2* Brz 2	399	Łąkta *2* Łą 2	>68	Rzezawa Pzez 1	403
Brzeźnica *3* Brz 3	372	Łęki Górne *2* ŁG 2	>915	Secemin *IG-11* S 1	1471
Brzozowa *1* Brzoz 1	162	Łęki Górne *3* ŁG 3	>283	Siercza *1* Sier 1	>395
Cikowice *1* Ci 1	390	Łobzów *1* Łob 1	479	Skalbierz *3* Sk 3	769
Czyżyczka *1* Czyż 1	>310	Łopuszno *IG-1* Łо 1		Skalbmierz *4* Sk 4	~620
Dąbie Dąb	>230	Łowczów *1* Łow 1	598	Słomniki *IG-1* Sł 1	395
Dąbrowa Tarnowska DT 4	>1142	Łuczyce *1* Ł 1	252	Słupiec *1* Słup 1	>1135
Dobczyce *1* Dob 1	206	Marszowice *1* Ma 1	325	Smęgorów *6* Smę 6	>1167
Dobczyce *2* Dob 2	>975	Mędrzechów *1* Mę 1	>988	Solec *3* Sol 3	>1189
Dobczyce *3* Dob 3	>628	Michałów *1* M 1	>1200	Strożyska *1* Str 1	>1141
Dobczyce *4* Dob 4	278	Michałów *3* M 3	>780	Strożyska *5* Str 5	1185
Dobczyce *8* Dob 8	151	Miechowice Wielkie *1* Mie 1	>701	Sufczyn *1* Suf 1	521
Dobiesławice *1* Do 1	996	Mikluszowice *1* Mi 1	483	Ślężany Ślęż 1	~1260
Dodów *2* Dod 2	>910	Milianów *IG-1* Mł 1	1724	Tarnów *19* Tar 19	652
Doluszyce *1* Dol 1	367	Mniszów Mn 16	531	Tarnów *33* Tar 33	690
Dziewin *2* Dzi 2	439	Mogilany *1* Mog 1	>124	Trzebunia *2* Trzeb 2	>320
Gdów *4* Gd 4	>413	Nasiechowice *1* Na 1	465	Trzonów *1* Tr 1	896
Gidle *1* G 1	1970	Nieczajna *3* Niecz 3	1275	Uniejów *1* U 1	702
Gidle *5* G 5	2364	Niepołomice N 3	293	Węchadłów *1* Wę 1	901
Gomunice *2* Go 2	~3800	Niepołomice N 11	272	Węgleszyn *IG-1* Wę 1	1671
Gomunice *5* Go 5	~3800	Niwki *3* Ni 3	1320	Węgrzynów *IG-1* We 1	873
Gomunice *7* Go 7	3164	Niżowa *1* Niż 1	>431	Widoma Wid 1	420
Gomunice *8* Go 8	2892	Odmęt *1* Odm 1	>1374	Wierzchosławice *1* Wi 1	700
Grabie *2* Gr 2	375	Opatkowice *1* O 1	520	Wiśnicz *2* Wiś 2	>763
Grabina *1* Grab 1	>902	Ostrów *1* Os 1	>1000	Wiśniowa *4* Wiś 4	>271
Granice *2* Ga 2	2437	Pacanów *1* Pac 1	>1425	Wiśniowa *6* Wiś 6	96
Grobla *1* G 1	527	Pawęzów *2* Paw 2	>886	Włoszczowa *IG-1* Wł 1	1400
Grobla *28* G 28	477	Pawęzów *3* Paw 3	>1307	Wola Libertowska *1*	720
Grobla *33* G 33	476	Pągów *IG-1* Pg 1	2042	Wola Rzędzińska *1*	
Gumniska Gum 1	717	Pleśna *1* Pl 1	>884	Wola Rz 1	>828
Iwkowa *1* Iwk 1	216	Pleśna *2* Pl 2	>927	Wolbrom *1* Wol 1	>440
Jadowniki Mokre *1* Jad. M 1	831	Pławowica *305* Pł	>610	Wolica *1* Wol 1	>429
Jadowniki *6* Jad 6	352	Pogórska Wola *8* PgW 8	>274	Wyciąże *1* Wy 1	286
Jadowniki *5* Jad 5	1072	Porąbka Uszewska *3* PU 3	488	Wyciąże *4* Wy 4	246
Jaronowice *IG-1* Ja 1	1116	Porąbka Uszewska *4* PU 4	453	Wyciąże *5* Wy 5	240
Jawczyce *1* Jaw 1	>410	Potok Mały *IG-1* PM 1	1099	Wyciąże *6* Wy 6	269
Jaworsko *1* Jawo 1	430	Proszowice *1* Pr 1	>1017	Wygoda *1* Wyg 1	889
Jędrzejów *IG-1* Jęd 1	1425	Puszcza *1* P 1	391	Zabierzów *1* Za 1	217
Kalina *1* Ka 1	558	Puszcza *2* P 2	437	Zabłocie *1* Zabł 1	>964
Kazimierza Wielka *1* KW 1	644	Puszcza *3* P 3	378	Zabrnie *1* Zabr 1	>1197
Kazimierza Wielka *2* KW 2	>882	Puszcza *4* P 4	390	Zakliczyn *1* Zakl 1	379
Kazimierza Wielka *4* KW 4	635	Puszcza *14* P 14	401	Zakrzów *1* Zak 1	>726
Kazimierza Wielka *10* KW 10	702	Raciborsko *1* Rać 1	791	Załuże *1* Zał 1	>927
Klimontów *1* Kli 1	1092	Racławice *2* Rac 2	626	Zborów *3* Zbor 3	>1398
Klonów *1* Kl 1	513	Radłów *1* Ra 1	>1792	Zborówek *2* Zbor 2	>1288
				Zieloan *1* Z 1	345

During the plotting of the sketch map (Fig. 1) data regarding the thickness obtained from 150 borehole profiles have been taken into account, most of these boreholes having been drilled by the Zjednoczenie Górnictwa Naftowego (Union of Oil Mining) (Table 1).

The present paper is based on an analysis of the thickness of the Permian, Triassic and Jurassic sediments. The thickness of the Cretaceous deposits has not been taken into consideration because of the relatively poor knowledge of their stratigraphy, the sedimentary value of their thickness being, moreover, reduced by the Tertiary and Quaternary denudation. No consideration has either been given to the thickness of the Miocene deposits in the Precarpathian Foredeep, since these deposits, being of molasse character are, genetically, connected in the first place with the Carpathian structures and but subordinately with the Platform.

In recording boreholes piercing Jurassic sediments lying directly on the surface of the investigated terrain or directly underlying Tertiary or Quaternary deposits, the erosionally reduced thicknesses of Jurassic sediments were supplemented by the value obtained from the nearest borehole where a relatively complete Jurassic profile has been preserved under the cover of Cretaceous sediments. Such thicknesses have been marked on the sketchmap as being approximate (∞). In cases when it was difficult to determine the value of the eroded Jurassic rocks, or (and) when the borehole did not pierce the lowermost Mesozoic or Permian members, the symbol "more than" ($>$) has been used.

The present writer is much indebted to Professor Dr. J. Znosko for discussing many of the problems broached in this paper.

The present paper contributes to the MR problem "Geodynomics of Poland".

DISTRIBUTION OF THE THICKNESSES OF SEDIMENTS

As is shown in the attached map (Fig. 1), in the Miechów Basin the thickness isolines of deposits from the Permian to the Jurassic — of which the Alpine structural stage is built — have a general WNW—ESE course. An exception to this is observable in the southernmost part of the area here studied where, below the overthrust Carpathians, the isopachytes of the Permian and Mesozoic platform deposists display a sub-equatorial direction.

Throughout this region, the above mentioned, southernmost part excepted, the thicknesses on the whole increase to the NNE, i.e. from the Silesian-Cracovian monocline to the anticlinorium of the Lower San, the Holy Cross Mts and the Radomsko elevation. They range from a. 200 m SW of Kraków to a. 3,800 m in the northern part of the Radomsko elevation (Fig. 1).

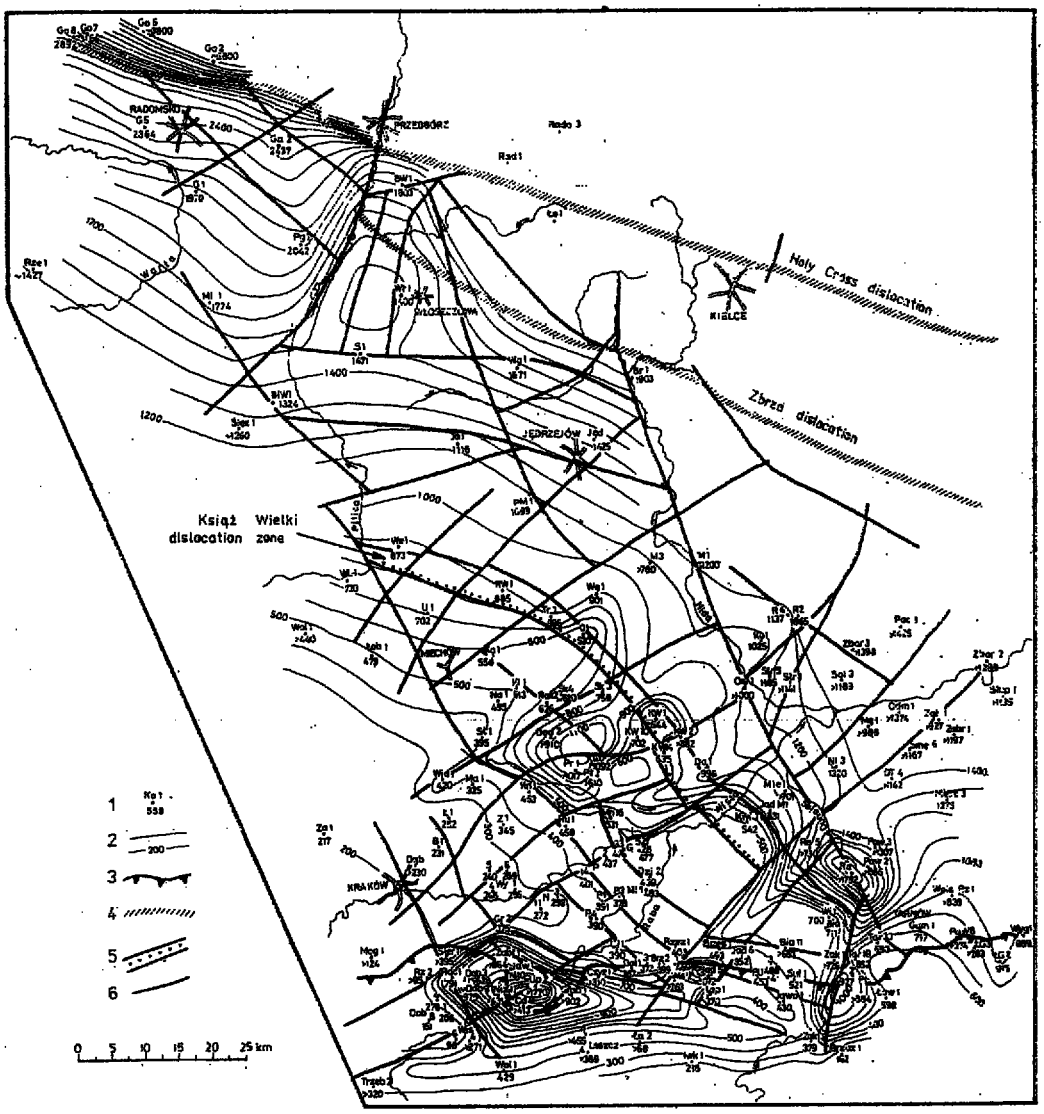

Fig. 1. Map of the thickness of Permian-Jurassic sediments in the Miechów Basin
1 — localization,, abbreviated name of borehole and thickness of the pierced sediments, *2* — isopachytes (every 100 m), *3* — edge of the Carpathian overthrust, *4* — the Holy Cross and Zbrza dislocations, *5* — Książ Wielki dislocation zone, *6* — other dislocations

In the southern part of the Miechów Basin, underlying the Carpathian overthrust, the isopachytes from the Permian to the Jurassic define an equatorial zone of increasing thicknesses. It is connected with the there observed clastic sediments of the Permian and the Buntsandstein whose maximum determined thickness (the Liplas 2 borehole) exceeds 1,300 meters. This area may be connected with the there

observed dislocation zone with a similar sub-equatorial trend. Taking into account the general palaeogeographic suggestions it may be supposed that the distinct decrease of the thickness of deposits south of the zone here discussed (Fig. 1) is connected with the proximity of the land which, during the Jurassic separated the area of platform sedimentation from the geosynclinal deposition.

LONGITUDINAL DISLOCATION

The direction trend of the thickness isopachytes of Permian and Mesozoic deposits are also determined by the directions of palaeostructures predominant in this area responsible for the spatial distribution of sediments. In the Miechów Basin the direction of isopachytes is subequatorial (WNW—ESE) it being in discordance with the present course of this structure but in concordance with the distribution of palaeozoic structures in the Małopolska-Holy Cross anticlinorium (the Holy Cross Mts, the Lower San anticlinorium, the prolongation of these structures under the Miechów Basin). Among these the Holy Cross dislocation zone calls for priority of discussion because of its major rank, and also because it probably intersects the Miechów Basin.

The Holy Cross dislocation, directed WNW—ESE, according to the 1 : 300 000 uncovered sketchmap of Poland (sheet Kielce, Czarnocki 1953) cuts the Palaeozoic rocks from the vicinity of Opatów in the east to that of Miedziana Góra in the west. Farther on this dislocation extends WNW, cutting the Mesozoic mantle as far as the area lying SW of Radoszyce (Sketchmap of Poland, sheet Kielce — Czarnocki 1953 and sheet Łódź — J. Jurkiewicz, F. Różycki & S. Z. Różycki 1954).

More recent documentation (1 : 2 000 000 Geological Atlas of Poland, by Znosko 1968, also the 1 : 500 000 Geological Map of Poland without Caenozoic rocks by Osika & al. 1972) shows the prolongation of the Holy Cross dislocation farther east to the Vistula and still more eastward thus conducing the length of this zone to exceed 240 km. The great size of this dislocation is also reasonably suggested by its age not younger than the Middle Cambrian (Żakowa & Kowalczewski 1978) and its deep-seated rooting. A paper by Guterch (Guterch & al. 1976) reliably indicates that the dislocation here discussed reaches at least the surface of Mohorovicic, descending 6—7 km on the northern side.

In such a situation the problem becomes important as to the possible continuation of this structure in concordance with its course from the vicinity of Radoszyce, sub-equatorially WNW.

On the 1 : 500 000 Geological Map of Poland (by Osika & al. 1972) the Holy Cross fracture within the zone between Ruda Strawczyńska and Radoszyce breaks up flabelliform-like into several minor faults arching NNW. On the other hand such authors as Głazek & Kutek (1976), Hakenberg (1978), and, foremost and for some time past, Znosko (1960, 1962, 1963, 1974a,b) see possibility of the prolongation of the Holy Cross fracture WNW at least to the Radomsko elevation. In view of small number of seismic investigations carried out respecting the Mesozoic margin of the Holy Cross Mts the solution of this problem is rather difficult. It seems, however, that the analytic data here presented favour the prolongation of the Łysogóra dislocation farther to the west.

In the seismic section 2-I-69/70 through boreholes Radoszyce *IG-1* and Radwanów *IG-1* in the direction of Włoszczowa, geologically interpreted by Jurkiewicz (1976), a dislocation zone has been observed SW of the Radwanów borehole, situated along the prolongation line of the Holy Cross fracture. North of that zone there is along this section a distinct increase in the thickness of the Mesozoic and Palaeozoic members. Also in the prolongation of this dislocation zone there occurs an equatorial twist of the eastern limb of the Mnin syncline SE of Pilczyca (Osika & al. 1972). Farther west it is possible approximately to determine — somewhat north of the Dobromierz anticline, the intersection by this dislocation zone of the Jurassic-Cretaceous cuesta (materials colected from the field by the writer), which is here the arbitrary boundary of the Miechów Basin. Further hypothetical course of the Holy Cross dislocation zone in the Miechów Basin and the Radomsko elevation may possibly be based on seismic sections (Przybyło 1964; Czerniak & Jurczyk 1970) interpreted by Morawska (1978) in turn re-interpreted by the present writer.

* * *

Beginning with the early works of Czarnocki and Samsonowicz, two basic units have been differentiated in the Palaeozoic of the Holy Cross Mts differing in palaeogeographic and palaeotectonic development. These two regions are: the northern one of Łysogóra and the southern one of Kielce, separated by the Holy Cross dislocation [1]. One of the essential features characterizing the two regions is the distinctly greater thickness of the Palaeozoic sediments in the Łysogóra region.

On the basis of deep boreholes drilled by the Geological Institute during the sixties in the northern part of the Miechów Basin (Jurkiewicz & al. 1966—1971, Jurkiewicz 1975), it has been observed that, to the south-east of the Pilica dislocation, the thicknesses of the various Palaeozoic members are greatly reduced as compared with those in the Kielce region (Kowalczewski 1971, Znosko 1974b, Hakenberg 1978). Moreover, it has been observed that the sedimentary and erosional gaps here are more frequent and of greater extent, the Cambrian sediments being completely absent. In this connection Pre-Cambrian deposits have been reached by drilling directly underlying various Palaeozoic members (Kowalczewski 1971, Jurkiewicz 1975).

In comparison with the Kielce region these differnces are distinct enough reasonably to suggest the differentiation of another region to the south of the Kielce region, one with the smallest subsidence among

[1] Szulczewski (1977) has proposed to distinguish the third region of the Holy Cross Mts Palaeozoic, i.e. the Zbrza-Chęciny region situated in the southern part of the Kielce area. He based his opinion on the facial relations in the Palaeozoic, especially during the Ordovician and Upper Devonian epoch. In the present writer's opinion Szulczewski's arguments may be enough for the differentiation of the additional, southern facial area in the Ordovician and Upper Devonian but oughtn't to lead to the differentiation of a new palaeotectonic unit in the southern part of the Kielce region as it resembles in its character rather the Łysogóry region than the Kielce region. Considering the results of thickness analyses of the Palaeozoic deposits and the extending of the erosional and sedimentary gaps in the both regions it is difficult to accept such a conception as suggested by Szulczewski.

those so far investigated. It is proposed to name it *the Jędrzejów region* covering the northern part of the inner zone in the sedimentary-metamorphous Caledonian geosyncline distinguished by Znosko (1974a, Fig. 3, zone *II*). The differentiation of such a region has been initially suggested by the writer with its approximate northern boundary (i.e. the southern one of the Kielce region) to be placed slightly north of the Brzegi borehole (*IG-1*) and further WNW in the vicinity of Włoszczowa (Hakenberg 1978). Now, however, an attempt would seem possible more exactly to determine this boundary or zone.

Borehole Brzegi *IG-1* is the northernmost one among the boreholes of Książ Wielki *IG-1*, Potok Mały *IG-1*, Węgleszyn *IG-1*, Jaronowice *IG-1*, Secemin *IG-1*, Biała Wielka *IG-1*, Jędrzejów *IG-1*, where Precambrian deposits underlying Palaeozoic rocks of small thickness have been reached. In these boreholes the thickness of the Palaeozoic (without the Permian) now range from 0 m (boreholes Węgleszyn *IG-1*, Jędrzejów *IG-1* and Brzegi *IG-1*) to 436 m in the Jaronowice *IG-1* borehole. It might, once more be stressed that the rocks here reached of Precambrian age are overlaid by various Palaeozoic members, those of Cambrian age being, however, absent.

The youngest Precambrian rocks known north of the Brzegi *IG-1* borehole occur as outcrops in the cores of the Zbrza and Lisów anticlines (Filonowicz 1969, Deczkowski & Tomczyk 1969, Tomczyk 1974, Osika & al. 1972). In these structures the Precambrian sediments are discordantly overlaid by Ordovician or Lower Devonian rocks (Filonowicz 1969, Deczkowski & Tomczyk 1969, Tomczyk 1974).

In the writer's opinion, the absence of Cambrian deposits in the boreholes and outcrops here discussed — regardless whether primary or secondary — whose presence is so characteristic in the Palaeozoic profiles of the two Holy Cross regions, provides an additional diagnostic feature assignable to the third region, that of Jędrzejów, lying south of the Kielce region.

In the situation thus described the dislocations cutting off in the north the asymmetrical anticlines of Zbrza and Lisów might reasonably be supposed to be the boundary zone for both regions: that of Kielce and of Jędrzejów.

Along these dislocations herafter referred to as *the Zbrza dislocation*, the above anticlines are in the north overthrust onto the Upper Jurassic deposits. The present course and function of these dislocations refer them to the young Post-Upper Jurassic, and probably Laramide age. However, an analysis of their extents, shows that they only partly coincide with the Laramide trends (SE—NW), while their major fragments are sub-equatorially directed (SEE—WNW) (Czarnocki 1953, Filonowicz 1968, Stupnicka 1972, Hakenberg 1974, Osika & al. 1972) this being characteristic of the older structural stages.

On this basis, also taking into the account the presence or absence of Precambrian and Cambrian rocks (see above) the occurrence may be here supposed — at least from the Cambrian — of a dislocation zone subsequently repeatedly rejuvenated and modified. On the 1 : 500,000 map (Osika & al. 1972) it runs east as far as the vicinity of Staszów and west to Tokarnia with a total length of 50 km. Still farther to the north-west this dislocation was prolonged to the vicinity of Gruszczyn (Czarnocki 1953, Doktorowicz-Hrebnicki & al. 1955) and even Przedborz (Osika & al. 1972), the direction assigned thereto being SE—NW, i.e. in conformity with the Laramide structures.

In the writer's opinion, however, it seems but reasonable to suppose further prolongation of this dislocation zone to the west of Tokarnia in conformity with its subequatorial extension. This is partly shown by the maps of Filonowicz (1968), Hakenberg (1974), Jurkiewicz (1975, 1976) and by the geophysical documentation of Przybyło (1964, seismic profiles *14-V-64*, *15-V-64*, *16-V-64*). This interpretation of the dislocation zone under discussion suggests that it is being shifted slightly S on the transversal fault along the Nida river. In its further course directed WNW it would intersect the Małogoszcz range south of Małogoszcz eventually to join the Małogoszcz dislocation of Jurkiewicz (1975, 1976) extending slightly further on N of Włoszczowa.

Such a dislocation zone, whose particular fragments have, generally speaking, been previously studied and are now, after a basic leading pattern, united into one structural unit, may be supposed to total a lenght of 100 kilometres.

As has already been mentioned this zone may well be expected to separate regions differing during the Palaeozoic (without the Permian) in their paleogeographic and paleotectonic development. The Jędrzejów region would differ from the Kielce region in smaller thickness of deposits, greater sedimentary and erosional gaps, also in the primary or secondary absence of Cambrian depotis.

THE ARRANGEMENT OF THE MAJOR DISLOCATIONS AS RELATED TO THE THICKNESS OF DEPOSITS FROM THE PERMIAN TO THE JURASSIC

In the short description already given in this paper of the spatial distribution of the thickness in the Miechów Basin of sediments from the Permian to the Jurassic the most characteristic feature is the sub-equatorial direction (WNW—ESE) of the arrangement of the thickness isolines of these rocks. Such an arrangement of the thickness isolines probably resulted from longlasting vertical shifting along the major dislocation zones whose general trends undoubtedly resembled the isopachyte direction of today, i.e. WNW—ESE. Hence these were zones of longitudinal dislocation, however, not in relation to the present geological boundaries of the Miechów Basin but in relation to the old palaeogeographic regions or palaeostructures.

In conclusion of previous reflections such major dislocation zones were represented by those of Łysogóra and Zbrza stretching from the Holy Cross Mts area into the Miechów Basin as an essential palaeogeographic factor during the Palaeozoic. Their bearing in the Palaeozoic on the distribution of zones with tendencies to subsidence varying in degree

(the regions of Łysogóra, Kielce and Jędrzejów) has already been pointed out. Here it should be stressed that, similarly as in the Palaeozoic, there is an increase in the thickness of Permian, Triassic and Jurassic deposits towards the Holy Cross Mts and the Radomsko elevation (vide Fig. 1, also Pożaryski 1971, 1976, Głazek & Kutek 1970, 1971, 1976, Hakenberg 1978) while, as in the Palaeozoic, these dislocations may also play the role of boundary zones separating regions differing distinctly in the thickness of Permian and Mesozoic sediments. This is clearly observable north and south of the Holy Cross dislocation in comparing the thickness of the lower Mesozoic members in boreholes Łopuszno *IG-1* and Radwanów *IG-1*, respectively 1054 and 1352 m thick, as well as the rapidly increasing thickness of the Permian-Mesozoic (without the Cretaceous) to the north on the Radomsko elevation (Fig. 1). Greater thicknesses of the Buntsandstein in the Łysogóra region are also reported by Głazek & Kutek (1976). Similar conditions are observable on either side of the Zbrza dislocation: the Permian-Triassic and Jurassic being 1400 m thick in the Włoszczowa *IG-1* borehole and 1803 m in the Boża Wola *IG-1* borehole.

Moreover, it seems that the distribution pattern of the thickness of Permian and Mesozoic deposits and in the dislocation zones of the middle part of the Miechów Basin suggests a reasonable hypothetical outline of the southern boundary of the Jędrzejów region. This boundary could be drawn along the dislocation zone with a ESE—WNW course, comprising the Czepiec and Książ Wielki faults (Jurkiewicz 1975). Hereafter this dislocation will be referred to as the Książ Wielki dislocation zone (Fig. 1). Similarly, as the previously described Holy Cross and Zbrza zones, that named the Książ Wielki zone separates the Jędrzejów region built of Permian and Mesozoic sediments having a relatively greater thickness from the southern region with a smaller thickness of sediments.

The isopachyte direction of the Permian-Mesozoic sediments, resulting from long-lasting vertical shifting connected with longitudinal dislocations, resembles that of the Holy Cross direction. In some regions of the Miechów Basin its monotony is relieved by secondary transversely arranged zones with thicknesses varying in degree (Fig. 1). It seems probable that these thicknesses are connected with the system of transversal dislocations. An area of decreased thickness may be here distinguished connected with the Włoszczowa elevation (Morawska 1979) as well as several successive zones with thicknesses of varying degree between Miechów and Tarnów. In the last named region zones with increased thicknesses of sediments represent transversal structural subsidences. They had been buried by variegated clastic deposits (mostly sandstones and conglomerates) of the Lower and Middle Buntsandstein, further S possibly also those of the Permian, with a thickness ranging

up to and exceeding one thousand metres. This subsidence zone divided by paleostructural elevations represents an area of relatively strongly developed palaeorelief resulting from Synhercynian movements.

Laboratory of Geological Cartography,
Institute of Geological Sciences,
Polish Academy of Sciences,
Al. Żwirki i Wigury 93, 02-089 Warszawa, Poland

REFERENCES

CZARNOCKI J. 1953. Przeglądowa mapa geologiczna Polski w skali 1 : 300 000. Wydanie *B*, ark. Kielce. *Państwowy Instytut Geologiczny*. Warszawa.

DECZKOWSKI Z. & TOMCZYK H. 1969. Geological structure of the Zbrza Anticline in the South-Western Part of the Góry Świętokrzyskie. *Biul. Inst. Geol.*, **236**(2), 143—175. Warszawa.

DOKTOROWICZ-HREBNICKI S. & RÓŻYCKI S. Z. 1949. Przeglądowa mapa geologiczna Polski w skali 1 : 300 000. Wydanie *A*, ark. Kraków. *Państwowy Instytut Geologiczny*. Warszawa.

— & al. 1955. Przeglądowa mapa geologiczna Polski w skali 1 : 300 000. Wydanie *B*, ark. Kraków. *Instytut Geologiczny*. Warszawa.

FILONOWICZ P. 1968. Morawica (Objaśnienia do szczegółowej mapy geologicznej Polski), 1—100. *Wydawnictwa Geol.* Warszawa.

— 1969. Kambr dolny i prekambr okolic Szczecna. *Kwart. Geol.*, **13**(4), 940—941. Warszawa.

GIŻEJEWSKA M. 1977. Sprawozdanie z prac wykonanych w roku 1977, *Arch. Inst. Nauk Geol. PAN*. Warszawa.

GŁAZEK J. & KUTEK J. 1970. The Holy Cross Mts area in the Alpine diastrophic cycle. *Bull. Acad. Pol. Sci. Sér. Sci. Sér. Sci. Géogr.*, **18**(4), 227—235. Varsovie.

— & — 1971. The area of the Świętokrzyskie Mountains in Alpine diastrophic cycle. *Przegl. Geol.*, **19**, 443—448. Warszawa.

— & — 1976. Powaryscyjski rozwój geotektoniczny obszaru świętokrzyskiego. *In*: *Przewodnik 48 Zjazdu Pol. Tow. Geol.*, 14—51. Warszawa.

GORNIAK Z. & JURCZYK I. 1970. Opracowanie badań sejsmicznych wykonanych w rejonie Gidle-Złoczew przez grupę sejsm. nr XI w 1970 roku, PGGN Kraków. *Arch. Inst. Geol. CUG*. Warszawa.

GUTERCH A., KOWALSKI T. J., MATERZOK R., PAJCHEL J. & PERCHUĆ E. 1976. O głębokiej strukturze skorupy ziemskiej w rejonie Gór Świętokrzyskich. *In*: *Przewodnik 48 Zjazdu Pol. Tow. Geol.*, 52—53. *Wyd. Geol.* Warszawa.

HAKENBERG M. 1974. Chęciny (Objaśnienia do szczegółowej mapy geologicznej Polski), 1—86. Warszawa.

— 1977. Dokumentacja badań wykonanych w roku 1977. *Arch. Inst. Nauk Geol. PAN*, Warszawa.

— 1978. Albian—Cenomanian palaeotectonics and palaeogeography of the Miechów depression, northern part. *Studia Geol. Pol.*, **58**, 1—104. Warszawa.

JAWOR E. 1970. The structure of the deep substratum in the region east of Cracow. *Acta Geol. Pol.*, **20**(4), 715—769. Warszawa.

JURKIEWICZ H. 1974. Development of the Triassic in the central area of the Nida Trough. *Kwart. Geol.*, **18**(1), 90—109. Warszawa.

— 1975. The geological structure of the basement of the Mesozoic in the central part of the Miechów Trough. *Biul. I.G.*, **285**, 5—100. Warszawa.

— & al. 1966—1971. Badania struktur paleozoicznych na obszarze niecki Nidy. Wiercenia' A — Jaronowice *IG-1*, B — Węgleszyn *IG-1*, C — Węgrzynów *IG-1*, D — Potok Mały *IG-1*, E — Pągów *IG-1*, F — Jędrzejów *IG-1*, G — Książ Wielki *IG-1*, H — Milianów *IG-1*, I — Secemin *IG-1*, J — Włoszczowa *IG-1*, K — Biała Wielka *IG-1*. *Arch. Inst. Geol. Kielce*, Warszawa.

— & SZCZERBA A. 1976. Zbadanie permsko-triasowej pokrywy osłaniającej cokół Gór Świętokrzyskich i jej podłoża. *Arch. Inst. Geol. CUG*. Kielce, Warszawa.

JURKIEWICZOWA I., RÓŻYCKI F. & RÓŻYCKI S. Z. 1954. Przeglądowa mapa geologiczna Polski w skali 1 : 300 000. Wydanie *B*, ark. Łódź. *Państwowy Instytut Geologiczny*, Warszawa.

KLUCZNIK A. & GÓRNIAK Z. 1968. Opracowanie badań sejsmicznych wykonanych w rejonie Koniecpol—Włoszczowa—Nagłowice—Jędrzejów—Wodzisław—przez grupę sejsm. nr XII w 1968 roku, PGGN Kraków. *Arch. Inst. Geol. CUG*. Warszawa.

— BOGURDOWICZ J. 1967. Opracowanie badań sejsmicznych wykonanych w rejonie Włoszczowa—Szczekociny—Wodzisław—Jędrzejów—Pławowice—Skalbmierz przez grupę sejsm. nr XII w 1967 roku, PGGN Kraków. *Arch. Inst. Geol. CUG*. Warszawa.

KONIOR K. 1974. Geological structure of the Rzeszotary elevation in the light of recent geophysical and drilling data. *Rocz. Pol. Tow. Geol.*, **44**(2—3), 321—375. Kraków.

KOWALCZEWSKI Z. 1971. Główne rysy tektoniki Gór Świętokrzyskich.ż In: *Przewodnik 43 Zjazdu Pol. Tow. Geol.*, 10—19. Warszawa.

KUTEK J. & GŁAZEK J. 1972. The Holy Cross area, Central Poland, in the Alpine Cycle. *Acta Geol. Pol.*, **22**(4), 603—653. Warszawa.

— WIERZBOWSKI A. 1977. Sprawozdanie z prac wykonanych w roku 1977. *Arch. Inst. Nauk. Geol. PAN*. Warszawa.

MORAWSKA A. 1978. Dokumentacja badań wykonanych w roku 1978. *Arch. Inst. Geol. PAN*, Warszawa.

— 1979. Palaeotectonic evolution of Włoszczowa elevation during the Permian and the Lower Triassic. *Bull. Acad. Pol. Sci., Sér. Sci de la Terre*, **27**(1—2), 25—31. Varsovie.

MORYC W. 1971. The Triassic of the Foreland of Central Carpathians. *Rocz. Pol. Tow. Geol.*, **41**(3), 419—486. Kraków.

OSIKA R., POŻARYSKI W., RÜHLE E. & ZNOSKO J. *(Eds)*, 1972. Mapa geologiczna Polski bez utworów kenozoicznych w skali 1 : 500 000. *Instytut Geologiczny*, Warszawa.

POŻARYSKI W. 1971. The tectonics of the Radomsko elevation. *Rocz. Pol. Tow. Geol.*, **41**(1), 169—179. Kraków.

— 1976. Ogólna charakterystyka tektoniczna mezozoiku świętokrzyskiego. In: *Przewodnik 48 Zjazdu Pol. Tow. Geol.*, 5—13. Warszawa.

PRZYBYŁO S. 1964. Opracowanie badań sejsmicznych wykonanych w rejonie Radomsko—Włoszczowa—Szczekociny przez grupę sejsm. nr V w 1964 roku, PGPN Kraków, *Arch.' Inst. Geol. CUG*. Warszawa.

STUPNICKA E., 1972. Tectonics of the SW margins of the Holy Cross Mts. *Biul. Geol. Wydz. Geol. UW*, **14**, 21—114. Warszawa.

SZULCZEWSKI M. 1977. Main facial regions in the Palaeozoic of the Holy Cross Mts. *Przegl. Geol.*, **8/9**, 428—432. Warszawa.

TOMCZYK H. 1974. Struktury epok tektonicznych bajkalskiej, kaledońskiej i waryscyjskiej, Góry Świętokrzyskie. *In: Budowa Geologiczna Polski*, **4**(1), 128—198. Warszawa.

ZAWIDZKA K. 1977. Sprawozdanie z prac wykonanych w roku 1977. *Arch. Inst. Nauk. Geol. PAN*. Warszawa.

ZNOSKO J. 1960. Tectonic of the Częstochowa Region. *Przegl. Geol.*, **8**, 418—424. Warszawa.

— 1962. Present status of knowledge of geological structure of deep substratum of Poland beyond the Carpathians. *Kwart. Geol.*, **6**(3), 485—510. Warszawa.

— 1963. Tectonic problems of the outer Carpathian part of Poland. *Prace Inst. Geol.*, **30**(4), 71—105. Warszawa.

— *(Ed.)* 1968. Atlas geologiczny Polski, 1 : 2 000 000. *Instytut Geologiczny*. Warszawa.

— 1974a. Tectonic units of Poland against the background of the tectonics of Europe. *Biul. Inst. Geol.*, **252**, 61—75. Warszawa.

— 1974b. Outline of the tectonics of Poland. *Biul. Inst. Geol.*, **274**, 7—49. Warszawa.

ŻAKOWA H. & KOWALCZEWSKI Z. 1978. Stratigraphy and tectonics of Palaeozoic deposits from the Góry Świętokrzyskie with reference to Jan Czarnocki's ideas. *Kwart. Geol.*, **22**(1), 17—37. Warszawa.

MACIEJ HAKENBERG

ZALEŻNOŚĆ MIĄŻSZOŚCI OSADÓW PERMU-JURY W NIECCE MIECHOWSKIEJ OD WAŻNIEJSZYCH USKOKÓW

Streszczenie

W wyniku zestawienia mapy miąższości osadów permu-jury na obszarze niecki miechowskiej (fig. 1) oraz na podstawie wcześniej opublikowanych danych okazało się, że istnieje szereg przesłanek wskazujących na długotrwałe, występujące w paleozoiku i mezozoiku tendencje charakterystyczne dla obszaru Gór Świętokrzyskich i niecki miechowskiej. Tendencje te polegają na stosunkowo znacznej subsydencji w regionie łysogórskim, która stopniowo maleje w kierunku południowym w regionie kieleckim oraz dalej, w wyróżnionym tu po raz pierwszy regionie jędrzejowskim, na co częściowo zwracano już wcześniej uwagę (Hakenberg 1969, 1978, Kutek & Głazek & Kutek 1970, 1971, 1976). Regiony te graniczą ze sobą wzdłuż stref dyslokacji świętokrzyskiej, zbrzańskiej i Książa Wielkiego (fig. 1).

W wyniku badań stwierdzono specyficzną zgodność planów paleostrukturalnych, wyrażającą się wspólnotą kierunków przebiegu izopachyt osadów permu, triasu i jury z prawie równoleżnikowym (ESE—WNW) kierunkiem przebiegu struktur paleozoicznych w Górach Świętokrzyskich i w podłożu niecki miechowskiej.

Stwierdzono również, że na południowy zachód od strefy dyslokacyjnej Książa Wielkiego istnieje dość znaczne urozmaicenie podpermskiego reliefu, związane zapewne z ruchami synwaryscyjskimi.