N E W S
OF THE NATIONAL ACADEMY OF SCIENCES OF THE REPUBLIC OF KAZAKHSTAN
SERIES OF GEOLOGY AND TECHNICAL SCIENCES
ISSN 2224-5278
Volume 1, Number 433 (2019), 133 – 142 **https://doi.org/10.32014/2019.2518-170X.17**

ӘОЖ 551.243. 38.17.21

R. M. Sadykov[1], V. V. Korobkin[2]

[1]Kazakh National Research Technical University named after K. I. Satpayev, Almaty, Kazakhstan,
[2]Kazakh-British Technical University, Almaty, Kazakhstan.
E-mail: sadykovraman@mail.ru; korobkin_vv@mail.ru

GEOLOGICAL INPUT DATA ANALYSIS FOR BASIN MODELING OF THE SOUTH PART OF KARAGANDA COAL DEPOSIT

Abstract. Geological and geophysical data were analyzed to perform basin modeling of the south part of Karaganda coal basin. In this regard, the basic material was selected, including geological structure (stratigraphy, lithology, facial analysis of folded and faulted structures, geodynamic modeling, depositional environment).

Karaganda coal basin experienced multi-stage deformation, during the geological evolution. It is expressed in the multiple kinds of the structural forms, which described for southern and eastern parts of the Karaganda coal basin, in the areas of Alabass anticline, Maykuduk uplift and Spasskaya suture area. The main stages of the deformation, followed with orogenesis occurred in Late Paleozoic-Early Mesozoic time. The region experienced the multi-stage development, which is observed by lithological, paleogeographical, paleotectonical and geodynamical reconstructions.

The age of the layers was clarified using the existing biostratigraphic study results. During the modeling, initial geological information was calibrated with coal maturation and porosity variation with the depth data. Basin modeling allowed minimizing the geological uncertainties, such as geological reconstructions, depositional environment and enriching the database on the Karaganda coal basin geology.

Karaganda coal basin is located in the Central Kazakhstan (figure 1). It's one of the biggest coal basins in Central Asia with proven reserves of 41.3 billion tons. There are 11 coal mines operating and producing 11 mln. tons of coal annually [1-3]. Moreover, there is significant potential for coal bed methane (CBM) production. According to KazEnergy report [4], the gas content in Karaganda basin's coals reaches 20 cubic meters per ton of coals located up to 500 meters, 27 cubic meters for deeper coals. The estimate of reserves of CBMis 8 trillion cubic meters. This amount is enough to supply the local industry with gas for more than 100 years.

Understanding of the geological processes occurring in the territory of Karaganda coal basin is essential for commercial production start. The data on the basin are abundant and were obtained in previous studies [5]. New methods of basin analysis were developed [6]. The basin modeling is necessary to arrange the abundant information, and identify the zones which are prolific for CBM production.

The basin modeling is the one of the methods, which utilizes the simulation of heatflow and regional tectonics to reproduce the evolution of the basin, since its formation. The process of organic matter maturation occurs under the influence of temperature and time, while rock compaction under the pressure. Thermal modeling assesses the quality of geological concepts, reduces uncertainties in geological conditions and ages and finally gives the input data about physical properties and maturity of rocks through the time.

The most of Kazakhstan continent (accretionary collision paleo continent) was the extensive shelf sea basin with terrigeneous deposition in Famennian – Early Carboniferous (figure 1, 2). In the second half of Early Carboniferous the area was divided into Teniz, Zhezkazgan and Karaganda deposition basins with small isolated troughs on the north. The first two forms cupriferous and saliferous complexes, while to the west coal-bearing complexes were formed in Karaganda, Ekibastuz and other coal fields [1-3, 7, 8, 10].

Karaganda coal basin (figure 1), located in central part of Caledonian Segment, belongs to the intracontinental area. Carbonate-terrigeneous deposits with total thickness up to 4000 meters were accumulated in Famennian – Early Carboniferous (table 1). Famennian – Middle Carboniferous deposits are conformable and forms single structural stage. The depositions below and above are separated by sharp unconformities, which unites them in a single quasi-platform complex [7, 8].

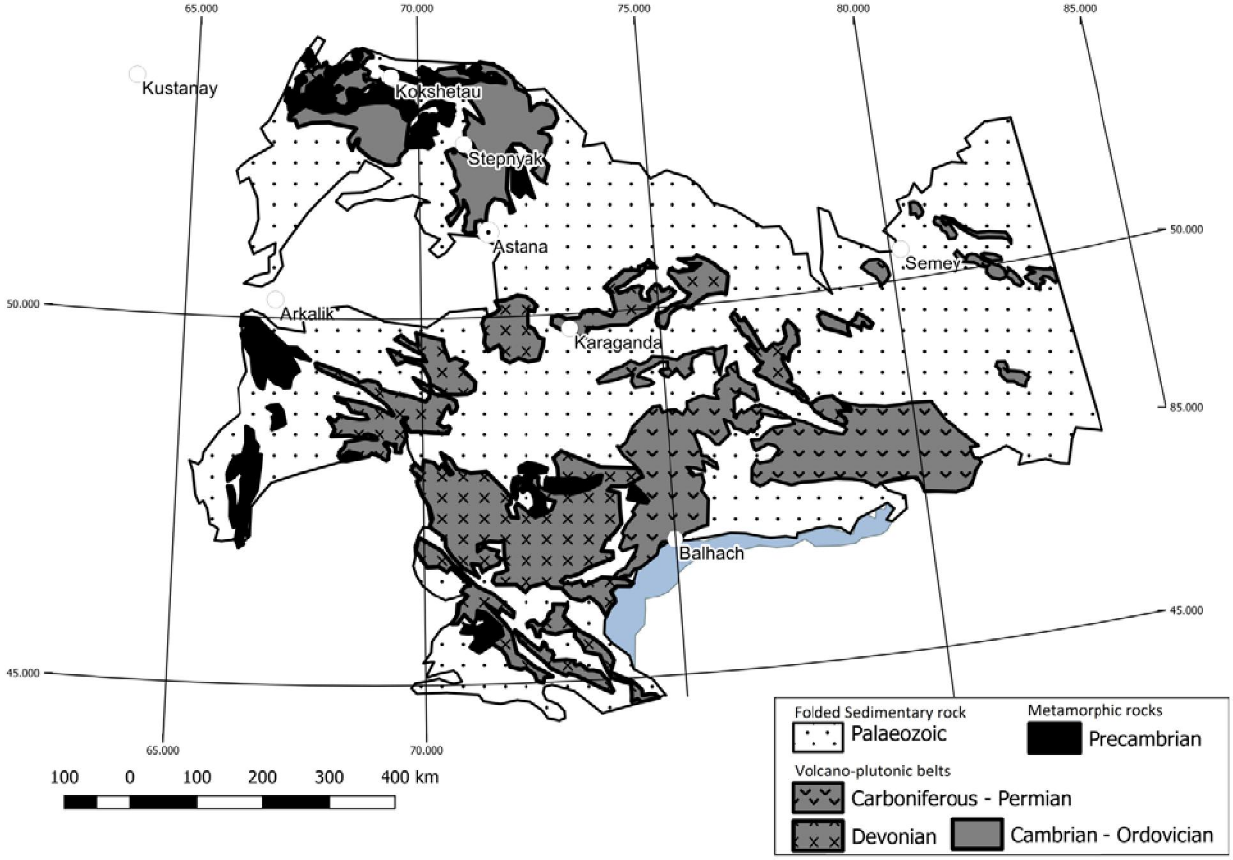

Figure 1 –Location of Karanda coalba sinrelative to Central Kazakhstan Paleozoics.

The composition and thicknesses Famennian – Middle Carboniferous stratigraphic units are shown in table 1. They are represented by interbedded green marine carbonate deposits, followed by grey lacustrine, terrigeneous and coal layers with presence of the reddish continental sediment [10]. Since the Middle Carboniferous up to Late Carboniferous terrigeneous clastic deposits are formed.

The Devonian and Late Paleozoic the subduction of Zhunghar-Balkhash oceanic crust under the Kazakhstan continent tend to the formation of volcanic belts in the south part of Kazakhstan continent. Zhungar-Balkhash paleo ocean's active continental margin adjoined to the south of Karaganda coal basin. Active magmatic events formed two continental margin type volcano-plutonic belts: 1) Devonian Central Kazakhstan and 2) telescoped Late Paleozoic (Carboniferous-Permian) Pribalkhash-Ili (figure 2). Karaganda basin was backarc basin next to active continental margin, where Devonian and Late Paleozoic magmatic events took place. Subduction was directed from south-east to north-west in Karaganda basin direction [7-10].

Devonian volcano-plutonic belts are heterogeneous structures of massive Emsian and Frasnian rheolitic-granite series type volcan over intrusion. The composition of volcanic association is represented by porfiric tuffs, lavas and ignimbrites. Among the volcanic intrusions, there is calc-alkali series, which are shown by associations with reduced alkalinity and associations with high potassium shoshonite series and continental molasses [7, 8]. The thickness of volcano-plutonic structures reaches 2000-3000 meters

Table 1 – Stratigraphic column of Karaganda Basin. Bold borders show the unconformities

SYSTEM	Serie	Stage	Suite	Subsuite	Index	Lithology	Coal Index	Faunal Index	Thickness
Quaternary					Q	Sand / Soil			0-12
Neogene					N	Neogene clay			0-20
Jurassic	Middle	Dogger	Mikhailovskaya		J_2mh	Siltstone			0-150
			Kumyskudukskaya		J_2km	Conglomerates Sandstone			30-50
	Lower	Lias	Dubovskaya		J_1db	Mudstone Sandstone	d_{VI} - d_I		40-200
			Saranskaya		T_3r-J_1sr	Sandstone Conglomerates			40-120
Tri.	Up.	Rhetian							
Carboniferous	Middle		Dolinskaya	Lower	C_2dl	Mudstone Sandstone Coalified siltstone	d_6 - d_1		300-350
			Nadkaragan- dinskaya	Upper	C_2ndk_3	Siltstone Coalified mudstone	N_4		240-260
		Namurian		Middle	C_2ndk_2	Siltstone Coalified mudstone	N_3 N_2		280-340
				Lower	C_2ndk_1	Siltstone Coalified mudstone	N_1		140-180
	Lower		Karagan- dinskaya	Upper	C_1v_3+$Skrg_3$	Sandstone Mudstone Silty coal	K_{20} - K_{16}	K_4	160-180
		Visean		Middle	C_1v_3+$Skrg_2$	Sandstone Coal Silty coal	K_{15} - K_{10}	K_3	330-380
				Lower	C_1v_3+$Skrg_1$	Shaly coal Coal Siltstone	K_{10} - K_1	K_2 K_1	120-160
			Ashlyarik- skaya	Upper	$C_1v_{1-2}ash_3$	Siltstone Mudstone Silty coal	a_1 - a_4	A_1 - A_4	220-240
				Middle	$C_1v_{1-2}ash_2$	Silty coal Sandstone Siltstone	a_5 - a_{12}	A_8 A_8' A_9	110-130
				Lower	$C_1v_{1-2}ash_1$	Silty coal Sandstone Siltstone	a_{13} - a_{20}	A_{10} - A_{11}	180-210
			Akkuduk- skaya	Upper	$C_1v_1ak_3$	Sandstone Siltstone			150
				Middle	$C_1v_1ak_2$	Siltstone Mudstone			170-210
				Lower	$C_1v_1ak_1$	Mudstone Tuffite lenses			250-440
					C_1v_1tr	Tuffite			40-60
		Tournaisian			C_1t	Limestone Marl			250-330
Devonian		Famennian			D_3fm	Marl			90-170
		Givetian- Frasnian			D_2gv-D_3fr	Effusive basement			2000

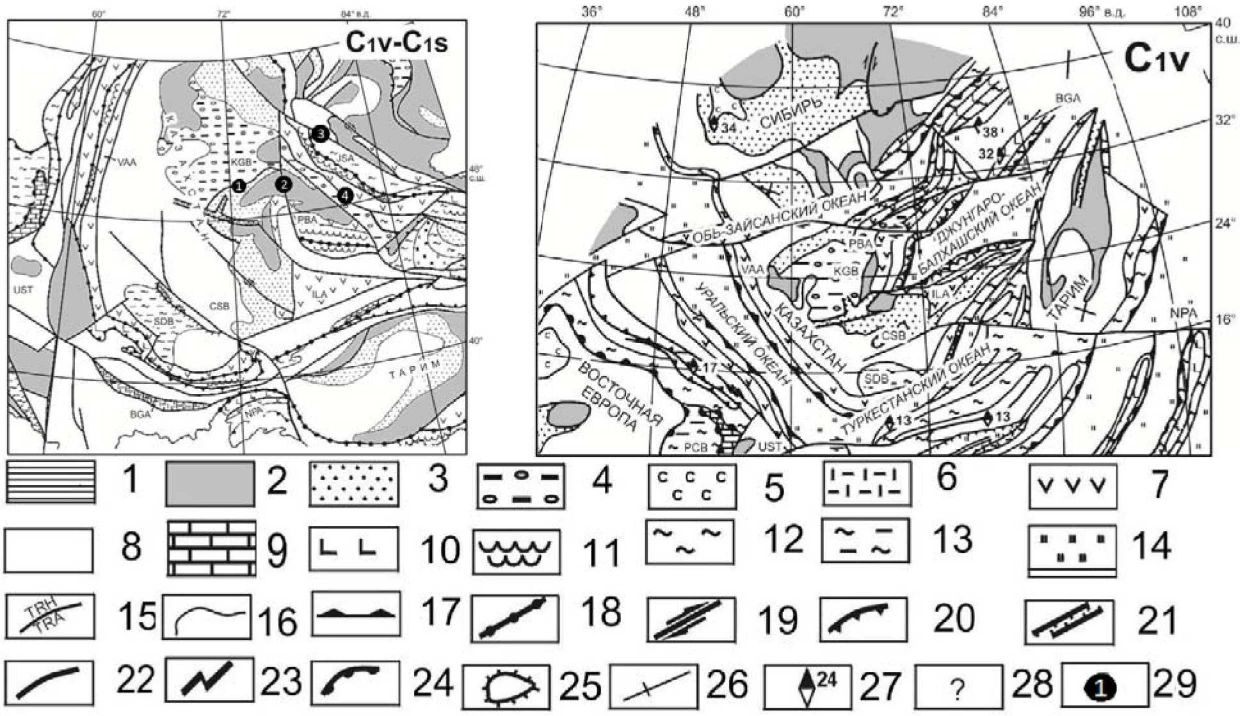

Figure 2 – Paleogeographic (1) and palynpascial (2) schemes
of Central Eurasia, Early Carboniferous – Visean-Serpukhovian [7, 8].

Continental environment: 1 - uplands, 2 - lowlands, 3 - fluvial-lacustrine, 4 - carbonaceous basins, 5 - evaporite basins, 6 - rift and orogenic volcanics, 7 - marginal continental volcanic belts and mature island arcs. Marine and oceanic environments: 8 - shelf, 9 - carbonate platforms, 10 - island arcs, 11 - accretion prisms, 12 - continental slope, bathyal, 13 - deep sea (deposits of black shales), 14 - abyssal. Tectonic and other signs: 15 - climatic boundaries (STH - subtropical humid, TRH - tropical humid, TRA - tropical arid, EQU - equatorial), 16 - facies boundaries, 17 - subduction zones, 18 - sutures, 19 - shifts, 20 - thrusts, 21 - grabens, 22 - uncertain faults, 23 - spreading axes and transform faults, 24 - shelf shelves, 25 - carbonate platforms, 26 - modern geographic coordinates direction, 27 - paleomagnetic vectors and paleolatitudes, 28 - presumed and controversial conditions, 29 - Main faults (figures in circles): Spass (1) Central Kazakhstan (2) Irtysh (3) Main Chingiz (4).

Microcontinent arrays: Ustyurt (UST). Sedimentary basins: Karaganda (KGB), Chu-Sarysu (CSB), Syr Darya (SDB); island volcanic arcs and marginal continental volcano-plutonic belts: Valerianovskaya (VAA), Ili (ILA), Pribalkhash (PBA), Jarma-Saurskaya (JSA), Bogdanshanskaya (BGA), North Pamir (NPA).

within the structure and hundreds meters outside. The belt is subdivided into Betpakdala, Sarysu-Teniz, Bayanaul (North-Kazakhstan) and Chingiz segments laterally from the west to the east [11]. Frontal and rear petrochemical zones exist within the belt. The zones are characterized by development of magmatic series on the edge of high-alkali series (rear zone) in the inner part of Kazakhstan continent. Active margin of the continent is marked by the change of petro-chemical composition in the zones between the Zhungar-Balkhash and Ob'-Zaisan paleo oceans. In Betpakdala, Sarysu-Teniz and Bayanaul segments the magmatism was active continental in Early Devonian – Famennian. Asymmetric magmatic zonation is associated with the suprasubduction area [11].

In the second part of Early Carboniferous main features took place on the border between Kazakhstan continent and Zhungar-Balkhash oceanic basin. Balkhash-Ili volcano-plutonic belt of continental margin type is formed as the result of subduction of oceanic crust under the Kazakhstan continent. In the modern structure of Kazakhstan paleozoics it has the shape of arc and divided into the segments (volcanic depressions): Ili, Ketmen, Tokrau, Kalmakemel, Bakanas, Alakol. Peculiarity of the volcanism in the belt is the equal proportion of basalt-andesitic and laparite-dacite series, but the composition changes in other segments. Plagiolaparite-dacite series was formed in early stage of belt development in conditions of ensialic island arc. It represented by Karkaraly suite (North Pribalkhash area). Lower Carboniferous basalts and andesitic basalts belong to sodium and calc-alkali series with high aluminum silicate content.

Abovementioned chemical characteristics show the affiliation to the volcanic series of ensialic island arc. The eruption of great amount of predominantly acidic volcanic rocks occurs in Middle-Late

Carboniferous and Permian. The rocks consist of rhyolites, rhyodacites, trachyriolitesand their tuffs and the intrusions of subalkalinegranitoids. Areas of basalt-andesitic volcanism related to suture zones, while acid series distributed in distal parts, forming volcano-tectonic depressions, complicated by uplifts [7-10].

Karaganda segment was located on shelf marine basin attached to Spassk thrust to the south, Central Kazakhstan fault to the east and Irtysh fault to the north-east (figure 2).

At the end of Carboniferous and Early Permian collisional stage is started. It's related with granitoid magmatism. Drainless intermountain depressions was formed in the Central Kazakhstan with its arid climate. Intracontinental sea replaced the Zhungar-Balkhash oceanic basin, connected with the ocean to the west.

Central Kazakhstan orogen growthwas terminated in Early Permian, followed by complication of the structure in Late Permian – Triassic by slip movement, caused formation of large amplitude fault systems (up to several hundred kilometers). Central-Kazakhstan fault with arc shape was formed on the more ancient Ordovician-Devonian transform fault. North-East directed left-side slips was active in Spass shear zone. Formation of the «pool-apart» type basin on the territory of Karaganda coal field was related to the system of Early Mesozoic faults in Spass shear zone.

Collisional events caused the formation of complicated thrust and slit forms, especially on the south part of Karaganda basin. Taldykuduk block, located there, has a border with Spass shear zone, with distance 10-30 km from it.

As the result of the speed of orogenic process reduced and area transformed into foreland basin. Orogenic processes tend to the formation of uplift to the south of the basin, which was the source of molasses. Most of the sediment was deposited in the south part of Karaganda basin where the depression was the most. Part of these molasses then was eroded during Permian-Triassic erosion on the most of Karaganda basin (table 2).

Table 2 – Main structural complexes within Karaganda basin and their position within the crust

Structural complex	Age, lithology	Position
Upper platform	**Neogene-Quaternary** Gravel, pebble, sand, loam, sandy loam	Karaganda basin
Lower platform	**Triassic - Jurassic** sandstones, siltstones, marls with coal	
Quasi platform	**Middle Carboniferous** molasses (conglomerates, sandstones, siltstones) **Famennian – Lower Carboniferous** carbonate and terrigenous deposits with coal	
Oceanic continental	**LowerDevonian – Frasnianstage** contrast composition of the volcanic series - rhyolites, rhyodacites, dacites and their tuffs	The rim of Karaganda basin, monoclines. On the south, next to the Spass shear zone. Has complexities in folds and faults
Ensial island arc	**Silurian** Wackes, greywackes, turbidites **Middle – Upper Ordovician** andesibasalts, andesites and their tuffs	The rim of Karaganda basin
Oceanic	**Cambrian – Lower Ordovician** jasper; flint	North-west border of the basin and basin basement

Mesozoic rocks of Karaganda basin was formed in Rhetian – Lias and Dogger time. The deposition rate increased in Rhetian – Lias was reduced to Dogger. In Rhetian the thick layer of molasses was deposited. Lias deposits were partially eroded in the Middle of Dogger, when area relief stabilized. Climate aridization in Late Jurassic caused the termination of coals formation, which is manifested in Dogger deposits (up to 150 meters) consist of reddish terrigeneous rocks (figure 4).

The area was uplifted and eroded by the Late Jurassic. The tectonic movements was caused by the Late Cimmerian phase of Cimmerian orogenesis. Hercynian thrusts reactivated and new set of thrusts like Akzhar thrust was formed. The area was exposed to denudation up to Late Jurassic – Early Paleozoic. After the erosion, the area became covered by unlithified fluvial deposits of Neogen and Quaternary Ages. The sediments sources were hills located to the south and supplied by the modern rivers Nura and Sarysu. The area get its final appearance in the Middle of Neogene [7].

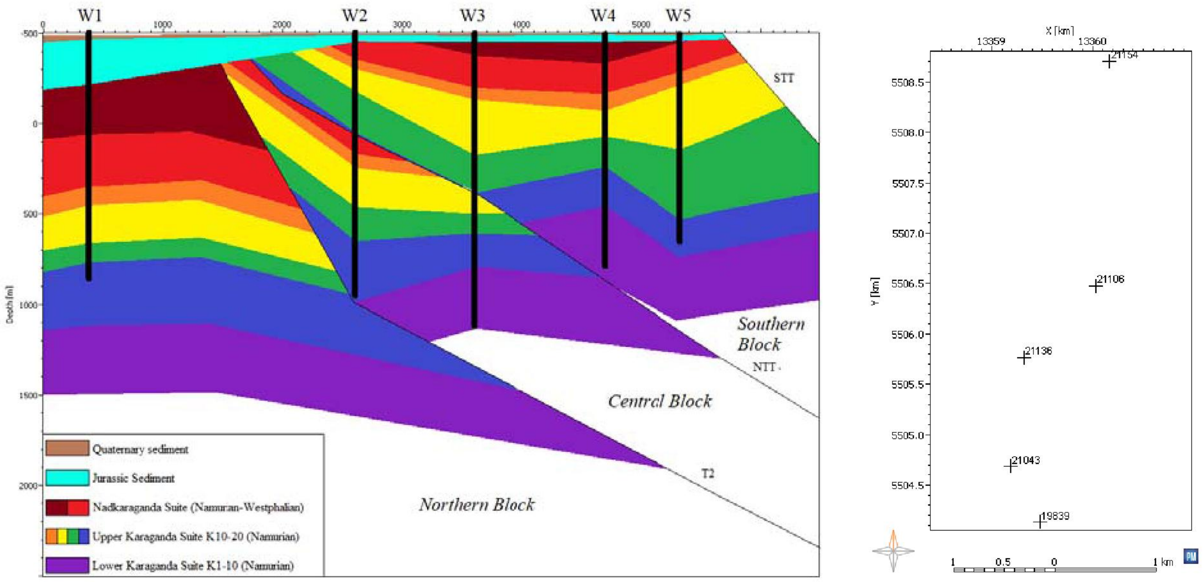

Figure 3 – Schematic cross-section and map of wells representing the modeled southern bound of Karaganda basin.
Two major thrust (North-Taldykuduk ThrustNTT and Thrust 2T2) divide the model into 3 main maturation blocks.
Small amplitude faults are not shown

Karaganda basin is divided into 4 zones. They are Tentek, Sherubay-Nura, Karaganda and Verkhne-sokurskaya. Within the basin, there are structural complexes contain Cambrian, Ordovician – Silurian, Devonian, Carboniferous, Jurassic and Cenozoic rocks. Taldykuduk block (figure 4) suffer significant structural transformation. It has overthrusts, thrusts and other faults, which are related to Spass shear zone. Fault-blocked structure of the region results the formation of cleats within the coals. Therefore the area is interesting from the CBM production point of view.

There are four stages of Carboniferous rocks deformation [6-8].

The first stage (Asturian phase) is the commencement of the collision or initial orogenesis stage, when the depression was subdivided into Karaganda, Shiterdy, Pavlodar and Teniz synclinories (figure 2). New thrust, including modeled North Taldykuduk thrust and Thrust 2 was originated since (figure 5). The basin had western border with Teniz depression, and pinched out to the east.

The second stage (Pfalzian phase) is the collisional stage, which caused the compartmentalization of coal beds by basement movement. As the result, Karaganda coal basin was subdivided into 3 parts: western part with Zaviyalov and Samara graben-synclines, central part with Karaganda basin and eastern part with Ashisu syncline (figure 6, 7). Zaviyalov graben-syncline and Teniz depression are separated by Zhaksykart horst-anticline. Zhailmin horst-anticline is the border between Karaganda basin and Ashisu syncline.

The third stage (Early Cimmerian phase) is the postcollisional stage refers toearly epeiric platform orogenesis, which expressed in thick deposition of molasses at the end of Lias. Sediment sources were uplifted and area was depressed. After that, the area was eroded up to Middle Dogger, when relief became flatten. Complete isolation from Paleotethys resultedaridization of the climate.

The final stage (Late Cimmerian phase) is the postcollisional stage refers to late epeiric platform orogenesis, followed the dogger succession, caused the territory uplift and erosion. Furthermore, the deformation reactivates existing and generates new (Akzhar thrust) faults and thrusts. In addition to these stages, insignificant deformation occurred in Neogene and Quaternary.

Input data, required for thermal modeling, according to [12] is following (figure 2-4):

– Structural model, including layers thickness, unconformities, faults, thrusts;

–Conceptual geological model (stratigraphic column, sedimentation settings, lithologies);

– Thermal and burial history;

– Tectonic history of the basin – tectonic model (burning, uplifting, erosion etc);

– Calibration data (vitrinite reflectance, temperature and porosity);

– Boundary conditions of water depth, heatflowand surface temperature.

Conceptual geological model includes several parameters. Rock ages were defined by biostratigraphic dating and represented in table 3 as bold text. Absolute ages of those rocks were taken from International Stratigraphic Column. Rest of layers ages were defined considering their thicknesses and relatively even deposition rate [9].

The territory of Karaganda basin experienced the following deformation stages during its geological evolution: Saurian, Asturian, Pfalzian, Early Cimmerian and Late Cimmerian orogenic phases. These stages are expressed in multiple observed faults and thrusts, synclines and anticlines (figure 4). The tectonic model, used for basin modeling is shown in table 4.

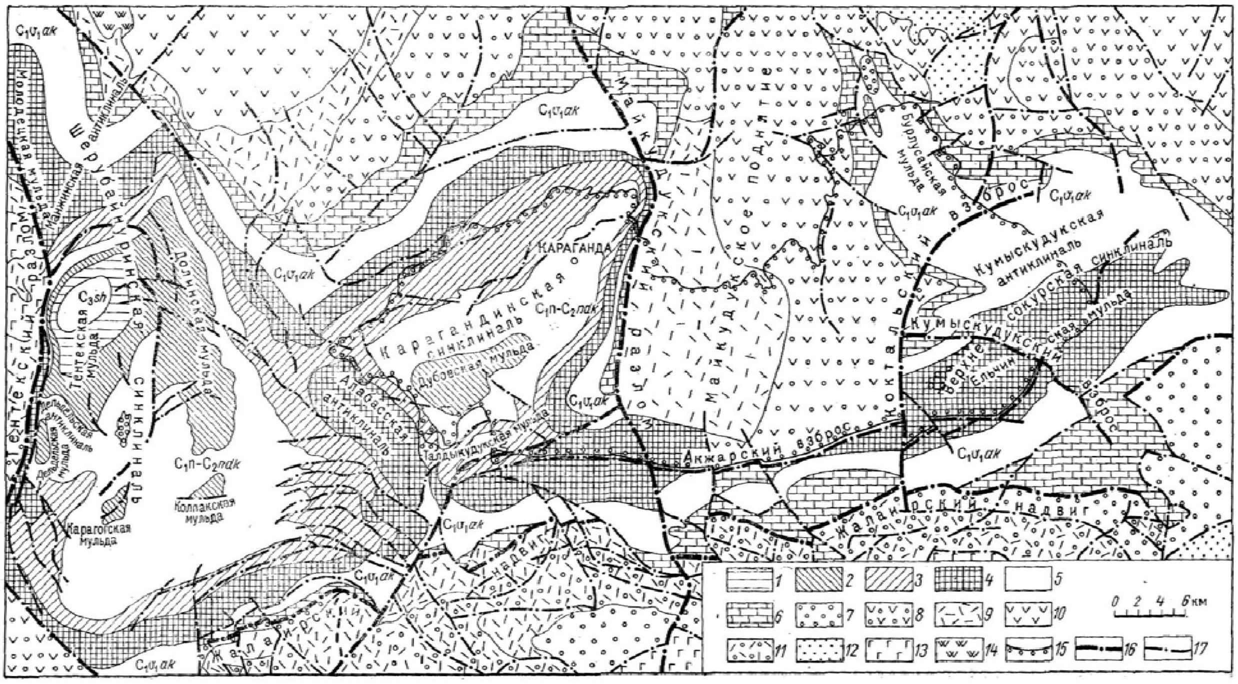

Figure 4 – Tectonical scheme of Karaganda basin

Carboniferoussediments, suiteswithsufficientcarbonation: 1 – Tentek; 2 – Dolin; 3 – Karaganda, 4 – Ashlyarik; without coal: 5 – Shahan (C_3sh), Nadkaraganda (C_1n-C_2ndk) Akkuduk (C_1v_1ak); 6 – *Tournai and Famennian deposits*; 7, 8 – *Givetian-Frasnian sediments* (upper substage) of south (7) and north(8) basin rims; 9 – *Koblenz-Givetian volcanic successions*(middle substage); 10, 11–*Lower Devonian*,effusive and their tuffs of north (10) and south (11) basin rims; 12 – *Silurian flysch*; 13 – Ordovician volcanic deposits; 14 – Cambrian terrigineous siliciclastic deposits; 15 – Mesozoic sediments contour; 16 – overthrusts and thrusts; 17 – other faults.

Thus, input data for basin modeling includes a geological concept, a tectonic model of the area geological evolution, and their thermobaric depositional conditions. The geological concept contains information about the age of the rocks, their thickness, erosion processes.

The structure of the Karaganda basin involves the rocks of six structural-material complexes. The basement is composed of the following complexes: 1) Cambrian-Lower Ordovician oceanic, 2) Middle-Upper-Ordovician island arc and Silurian pre-arc and back-arc terraces, 3) Devonian marginal continental. The cover consists of the following complexes: 4) Famennian-medium-quarry quasi-platform, 5) Triassic-Jurassic platform (lower structural stage), 6) Neogene-Quaternary (upper structural stage). Saurian, Asturian, Pfalzian, Early Cimmerian and Late Cimmerian orogenic phases influenced the formation of coal rock and created complex multi-stage formed folded and discontinuous shapes. The uncertainties of the geological concept were calibrated using data on maturity and rock deformation.

Table 3 – Absolute ages of layers and their thicknesses

Layer name	Event age	Base absolute age, Ma	Top absolute age, Ma	Av. Thickness, m
Q1	Pleistocene-Holocene	0.13	0.00	3
J_Eroded_2	Oxfordian	185.32	**154.00**	900
J_Eroded_1	Doggerian	202.72	185.32	500
J	Liasian – Doggerian	**203.00**	202.72	8
C_Eroded_2	Stephanian – Westphalian	**313.00**	**295.00**	2800
C_Eroded_1	Namurian	320.94	**313.00**	1500
Nadkaraganda		322.37	320.94	271
K20		322.85	322.37	90
K19		323.41	322.85	106
K18		323.85	323.41	83
K17-1		324.11	323.85	50
K16-K17		324.21	324.11	19
K15		324.45	324.21	45
K14		324.77	324.45	60
K13		324.93	324.77	30
K13-base		325.03	324.93	20
K12-3		325.48	325.03	84
K12		325.71	325.48	45
K11		326.00	325.71	54
K10	Late Visean	326.17	**326.00**	25
K9		326.22	326.17	8
K8-1		326.30	326.22	11
K7-K8		326.49	326.30	27.8
K6		326.72	326.49	34
K5		327.08	326.72	54
K4		327.35	327.08	40
K3		327.55	327.35	28.75
K2		328.00	327.55	67
K1	Middle Visean	329.00	**328.00**	64
A-suite			329.00	

Table 4 – Tectonic model of Karaganda basin

<table>
<tr><th>Age</th><th>Lithological and facial depositional environment</th><th>Tectonic movement direction</th><th>Orogenic phase</th></tr>
<tr><td>Neogene - Quaternary</td><td>Continental</td><td>Uplift</td><td>~~~ Alpine</td></tr>
<tr><td>Jurassic (eroded)</td><td rowspan="4">Continental
Platform
Arid</td><td>Uplift</td><td rowspan="2">~~~ Late Cimmerian</td></tr>
<tr><td rowspan="2">Doggerian</td><td rowspan="2">Immersion</td></tr>
<tr><td rowspan="2">~~~ Early Cimmerian</td></tr>
<tr><td>Liasian</td><td>Immersion</td></tr>
<tr><td>Late Carboniferous - Permian</td><td>Continental
Arid</td><td>Uplift</td><td>~~~ Pfalzian
~~~ Asturian</td></tr>
<tr><td>Visean – Namurian</td><td rowspan="2">Continental, shallow marine, boggy-lacustrine</td><td rowspan="3">Immersion</td><td rowspan="3">~~~ Saurian</td></tr>
<tr><td>Visean</td></tr>
<tr><td>Tournai - Famennian</td><td>Continental, shallow marine</td></tr>
<tr><td>Early Devonian - Frasnian</td><td>Andean type active continental margin</td><td>Uplift</td><td>~~~ Akkadian</td></tr>
<tr><td colspan="4">~~~ Unconformity</td></tr>
</table>

Р. М. Садыков[1], В. В. Коробкин[2]

[1]Казахский национальный исследовательский технический университет им. К. И. Сатпаева, Алматы, Казахстан
[2]Казахстанско-Британский технический университет, Алматы, Казахстан

АНАЛИЗ ИСХОДНЫХ ГЕОЛОГИЧЕСКИХ ДАННЫХ ДЛЯ БАССЕЙНОВОГО МОДЕЛИРОВАНИЯ ЮЖНОЙ ЧАСТИ КАРАГАНДИНСКОГО УГОЛЬНОГО МЕСТОРОЖДЕНИЯ

Аннотация. Выполнен анализ геолого-геофизических материалов для проведения бассейнового моделирования южной части Карагандинского угольного месторождения. В этой связи подобран необходимый базисный материал, включающий данные по геологическому строению (стратиграфии, литологии, фациальному анализу складчатым и разрывным структурам, геодинамическому моделированию, термобарическим условиям осадконакопления) рассматриваемого объекта.

В ходе геологической эволюции Карагандинский угольный бассейн испытал многоэтапные деформации, выраженные в многочисленных сочетаниях структурных форм, которые описаны для южной и восточной частей Карагандинского бассейна в зонах Алабасской антиклинали, Майкудукского поднятия и Спасской шовной зоны. Главные этапы деформации сопровождаемые активным орогенезом приходятся на позднепалеозойско-раннемезозойское время. Начиная с фамена, и по настоящее время регион прошел сложную многоэтапную историю развития, на что указывают литолого-фациальные, палеогеографические, палеотектонические и геодинамические реконструкции.

Возраст рассматриваемых толщ горных пород был уточнен на основании биостратиграфических данных предыдущих исследований. Исходная геологическая информация в процессе моделирования увязана с калибровочными данными зрелости углей и вариациями их пористости по глубине. Бассейновое моделирование позволило существенно минимизировать геологические неопределенности, такие как геодинамические реконструкции, условия осадконакопления и пополнить базу знаний о геологическом строении Карагандинского бассейна.

Р. М. Садыков[1], В. В. Коробкин[2]

[1]Қ. И. Сәтбаев атындағы Қазақ ұлттық техникалық зерттеу университеті, Алматы, Қазақстан,
[2]Қазақстан-Британ техникалық университеті, Алматы, Қазақстан

ҚАРАҒАНДЫ КӨМІР БАССЕЙНІНІҢ ОҢТҮСТІК БӨЛІГІН БАССЕЙНДІК МОДЕЛЬДЕУ ҮШІН НЕГІЗГІ ГЕОЛОГИЯЛЫҚ ДЕРЕКТЕРДІ ТАЛДАУ

Аннотация. Қарағанды көмір бассейнінің оңтүстік бөлігін бассейндік модельдеу үшін геологиялық-геофизикалық деректер талданды. Осыған байланысты негізгі деректертер іріктелді, оның ішінде зерттеу объектісінің геологиялық құрылымы (стратиграфия, литология, қатпарлы және үзілімді құрылымдарды фациялық талдау, геодинамикалық модельдеу, шөгінділердің жиналуының термобарикалық жағдайы).

Қарағанды көмір бассейні геологиялық эволюция кезінде көп сатылы деформацияны бастан кешті. Ол Қарағанды көмір бассейнінің оңтүстік және шығыс бөліктерінде, Алабас антиклиналь аудандарында, Майқұдық көтерілісінде және Спасск шеткі ауданында құрылымдық пішіндердің түрлі жиынтықтарынан көрініс табады. Белсенді орогенезбен қатар жүрген деформацияның негізгі кезеңдері кейінгі палеозой және ерте мезозой уақытында болды. Фаменнен бастап бүгінгі күнге дейін бұл аймақ күрделі көрсатылы даму тарихын кешірді. Бұл аймақтың литологиялық, палеогеографиялық, палеотектоникалық және геодинамикалық реконструкция нәтижесінен байқалады.

Бұған дейін жасалған биостатиграфиялық зерттеулердің нәтижелерін пайдалана отырып қабаттардың жасы анықталды. Модельдеу кезінде бастапқы геологиялық ақпарат көмірдің пісіп-жетілуі бойынша калибрлеу нәтижелерімен және көмір қабаттарының тереңдікпен кеуектілігінің өзгеруімен сәйкестендірілді. Бассейндік модельдеу геологиялық реконструкция, шөгінділердің жиналуының жағдайы сынды мәселелерде геологиялық тұрлаусыздықты азайтуға мүмкіндік берді, және Қарағанды көмір бассейнінің геологиясы бойынша дерекқорды кеңейтті.

Information about authors:

Sadykov R.M., Kazakh National Research Technical University named after K. I. Satpayev, Almaty, Kazakhstan; sadykovraman@mail.ru; https://orcid.org/0000-0002-5936-2036

Korobkin V.V., Kazakh-British Technical University, Almaty, Kazakhstan; korobkin_vv@mail.ru; https://orcid.org/0000-0002-1562-759X

REFERENCES

[1] Zholtaev G.Zh., Zhukov N.M., Bespaev Kh.A. The theory of forecasting and evaluating the minerals and raw materials base of the Republic of Kazakhstan // News of the National Academy of Sciences of the Republic of Kazakhstan. Series of Geology and Technical Sciences. 2018. Vol. 2, N 428. P. 36-43; https://doi.org/10.32014/2018.2518-170X

[2] Bekzhanov G.R., Koshkin V.Y., Nikitchenko I.I., et al. Geological structure of Kazakhstan. Almaty: Academy of mineral resources of the Republic of Kazakhstan, 2000. P. 396.

[3] Nikitchenko I.I. Minerals of Kazakhstan. Explanatory note to the 1:1 000 000 scale map of Kazakhstan Mineral Resources. Kokshetau, 2002. P. 188.

[4] KazEnergy. The National Energy Report 2015, “KAZENERGY” ALE. P. 374.

[5] Alekseev A.D., Ulyanova E.V., Vasilkovskiy V.A., et al. Structure peculiarities of coal's hazardous zones // GIAB. 2010. N 8. P. 152-163.

[6] Kovalchuk A.B., Hardinge B.C. Coal Industry of the Former USSR: Coal Supply System and Industry Development. CRC Press, 2002. P. 144.

[7] Atlas of the Lithology-Paleogeographical, Structural, Palinspastic and Geoenvironmental Maps of Central Eurasia. Scientific Research Institute of Natural Resources YUGGEO. ISBN: 9965-13-566-5. Almaty, 2002. Fig. 38, p. 132.

[8] Korobkin V.V., Buslov M.M. Geodynamics and Tectonophysics of the western part of Central-Asian folded belt (paleozoids of Kazakhstan) // Geology and geophysics. 2011. Vol. 52, N 12. P. 2032-2055.

[9] Buslov M.M. Terrain Tectonics of the Central Asian Folded belt // Geodynamics and Tectonophysics. 2014. Vol. 5, issue 3. P. 641-665.

[10] Bekman V.M., Koshkin V.Y., Gabai N.L. Carboniferous system // Geological Map of Kazakh SSR. Scale 1:500000. Serie Central Kazakhstan. Explanatory note. Almaty, 1981. P. 98-125.

[11] Kurchavov A.M., Grankin M.S., Malchenko E.G. et al. Zonation, Segmentation and Paleogeodynamics of Devonian volcanicbelts of Central Kazakhstan // Geotectonics. 2000. N 4. P. 32-43.

[12] Hertle M., Littke R., 2000. Coalification pattern and thermal modeling of the Permo-Carboniferous Saar Basin (SW-Germany) // Int. J. Coal Geol. 42. P. 273-296.