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## STRATIGRAPHY AND LITHOLOGY OF THE PALEOZOIC DEPOSITS IN THE TASBULAK GRABEN, SHU-SARYSU BASIN



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*Despite of more than 40-year history of prospecting work, the degree of geological and geophysical knowledge of the Shu-Sarysu basin is still very low. Current comprehensive study is based on the geological, geophysical, well and geochemical data from published literature and reports of the state institutions.*

*The Shu-Sarysu sedimentary basin evolved at the western margin of the Kazakhstan microcontinental plate in the beginning of Devonian. Subduction of oceanic crust under the microcontinent raised to magmatic and volcanic processes in the south and east territories of the basin. Afterwards, throughout the late Paleozoic, these areas became a source of the clastic sediments of the basin. Territory of the Shu-Sarysu basin was uplifted in the Triassic and Jurassic. This confirmed by the absence or very thin sediments of the Cretaceous and Tertiary in the territory of the basin.*

*The basement of the Shu-Sarysu basin is represented by the Precambrian and partially the Lower Paleozoic formations. They are dislocated, metamorphosed, and intruded by intrusions of various compositions and ages. The lithology and stratigraphy of the Paleozoic sediments in the north and west parts of the Shu-Sarysu basin are have the similar construction. This statement well confirmed by the well data from the parametric and prospecting wells drilled within the Tasbulak and Kokpansor grabens. Based on this data, the next lithological-stratigraphic layers are established within the Paleozoic sediments of the Tasbulak graben: carbonate-terrigenous-halogen Upper Devonian; terrigenous-carbonate Lower Carboniferous; continental terrigenous of the Middle-*

*Upper Carboniferous, terrigenous-halogenous of the Lower Permian and terrigenous-carbonate of the Upper Permian.*

**KEY WORDS:** *Shu-Sarysu basin, Tasbulak graben, Paleozoic deposits, stratigraphy, lithology.*

## СТРАТИГРАФИЯ И ЛИТОЛОГИЯ ПАЛЕОЗОЙСКИХ ОТЛОЖЕНИЙ ТАСБУЛАКСКОГО ГРАБЕНА ШУ-САРЫСУЙСКОГО БАСЕЙНА

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*Несмотря на более чем 40-летнюю историю поисково-разведочных работ, степень геологической и геофизической изученности бассейна Шу-Сарысу по-прежнему очень низка. Настоящее комплексное исследование основано на геологических, геофизических, скважинных и геохимических данных из опубликованной литературы и отчетов государственных учреждений.*

*Шу-Сарысуский осадочный бассейн сформировался на западной окраине Казахстанской микроконтинентальной плиты в начале девона. Субдукция океанической коры под микроконтинент вызвала магматические и вулканические процессы на южных и восточных территориях бассейна. В дальнейшем на протяжении всего позднего палеозоя эти территории стали источником обломочных отложений бассейна. Территория Шу-Сарысуского бассейна была поднята в триасе и юре. Это подтверждается отсутствием или очень малой мощностью отложений мела и третичного периода на территории бассейна.*

*Фундамент Шу-Сарысуского бассейна представлен докембрийскими и частично нижнепалеозойскими образованиями. Они дислоцированы, метаморфизованы и прорваны интрузиями различного состава и возраста. Литология и стратиграфия палеозойских отложений северной и западной частей Шу-Сарысуского бассейна имеют сходное строение. Это утверждение хорошо подтверждается данными параметрических и поисковых скважин, пробуренных в пределах грабенов Тасбулак и Кокпансор. На основании этих данных в пределах палеозойских отложений Тасбулакского грабена установлены следующие литолого-стратиграфические слои: карбонатно-терригенно-галогеновый верхнего девона; терригенно-карбонатный нижний карбон; континентальные терригенные среднего-верхнего карбона, терригенно-галогеновые нижней перми и терригенно-карбонатные верхней перми.*

**КЛЮЧЕВЫЕ СЛОВА:** *бассейн Шу-Сарысу, Тасбулакский грабен, палеозойские отложения, стратиграфия, литология.*

## ШУ-САРЫСУ БАСЕЙНІНІҢ ТАСБҰЛАҚ ГРАБЕНІНІҢ ПАЛЕОЗОЙ ШӨГІНДІЛЕРІНІҢ СТРАТИГРАФИЯСЫ МЕН ЛИТОЛОГИЯСЫ

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*Шу-Сарысу алабында іздестіру жұмыстарының 40 жылдан астам жүргізілгеніне қарамастан оның аумағының геологиялық-геофизикалық білімінің деңгейі өте төмен. Бұл кешенді зерттеу жарияланған әдебиеттер мен мемлекеттік мекемелердің баяндамаларынан алынған геологиялық, геофизикалық, ұңғымалық және геохимиялық деректерде негізделген.*

*Шу-Сарысу шөгінді алабы девон дәуірінің басында Қазақстан микроконтиненттік тақтасының батыс шетінде дамыған. Микроконтинент астындағы мұхит қыртысының суға түсуі бассейнді оңтүстік және шығыс аумақтарында магмалық және жанартаулық процестерге көтерілді. Одан кейін бүкіл палеозойдың соңындағы бұл аумақтар алаптың сынық шөгінділерінің қайнар көзіне айналды. Шу-Сарысу ойпатының аумағы триас пен юра дәуірінде көтерілген. Бұл алабының аумағында бор және үшінші кезеңнің өте жұқа шөгінділерінің жоқтығымен расталады.*

*Шу-Сарысу ойпатының іргетасы кембрийге дейінгі және ішінара төменгі палеозой формацияларымен ұсынылған. Олар дислокацияланған, метаморфозданған және әртүрлі құрамдағы және жастағы интрузиялармен интрузияланған. Шу-Сарысу ойпатының солтүстік және батыс бөліктеріндегі палеозой шөгінділерінің литологиясы мен стратиграфиясы ұқсас құрылысқа ие. Бұл мәлімдеме Тасбұлақ және Көкпансор грабендерінде бұрғыланған параметрлік және іздестіру ұңғымаларынан алынған ұңғыма деректерімен жақсы расталады. Осы деректер негізінде Тасбұлақ грабенінің палеозой шөгінділері шөгінде келесі литологиялық-стратиграфиялық қабаттар белгіленді: карбонатты-терригенді-галогенді жоғарғы девон; терригенді-карбонатты төменгі карбон; Орта-жоғарғы карбонның континенттік терригені, төменгі пермьдің терригенді-галогенді және жоғарғы пермьдің терригенді-карбонатты.*

**ТҮЙІН СӨЗДЕР:** Шу-Сарысу бассейні, Тасбұлақ грабены, палеозой шөгінділері, стратиграфия, литология.

**I ntroduction.** In the geological structure of the Shu-Sarysu basin, there are the following lithological and stratigraphic complexes: basement; Upper Devonian carbonate-terrigenous-halogen; terrigenous-carbonate Lower Carboniferous; continental red-colored Middle-Upper Carboniferous; terrigenous-halogen Lower Permian; terrigenous-carbonate Upper Permian and Mesozoic-Cenozoic platform cover. The basement of the Shu-Sarysu basin is represented by Precambrian and partially Lower Paleozoic formations. They are dislocated, metamorphosed, and intruded by intrusions of various compositions and ages. This complex of formations is widely developed in the side frames of the Shu-Sarysu basin in Ulytau, Karatau, Kirghiz Alatau, on Kendyktas, Shu block, Ergenекty-Zhuantoba anticlinorium and in separate areas of the Sarysu-Teniz watershed. In this article, the stratigraphic and lithological description of the Tasbulak graben is considered in more detail [1-9].

**Materials and methods.** This article summarizes the results of studies of the Tasbulak graben in the Shu-Sarysu basin based on available data, published literature and industry reports provided by oil and gas companies and government agencies.

**Results and discussions.** *Lithological and stratigraphic characteristics.* The following lithological and stratigraphic complexes are represented in the geological structure of the Shu-Sarysu basin: basement; Upper Devonian carbonate-terrigenous-halogen; terrigenous-carbonate Lower Carboniferous; continental red-colored Middle-Upper Carboniferous;

terrigenous-halogen Lower Permian; terrigenous-carbonate Upper Permian and Mesozoic-Cenozoic platform cover.

*Lithological and stratigraphic complexes of the basement.* Basement of the Shu-Sarysu basin of the basin by Precambrian and partially Lower Paleozoic formations. They are intensively dislocated, metamorphosed, and intruded by intrusions of various compositions and ages. This complex of formations is widely developed in the side frames of the Shu-Sarysu basin in Ulytau, Karatau, Kirghiz Alatau, on Kendyktas, Shu block, Ergenekty-Zhuantoba anticlinorium and in separate areas of the Sarysu-Teniz watershed. In addition, the rock associations of the basement were also penetrated by boreholes in a number of areas in the interior of the study basin. Most of them are composed of Proterozoic and Lower Paleozoic formations.

The Lower Paleozoic complex is composed of relatively less metamorphosed, but strongly dislocated Cambrian and Ordovician rocks. The rocks of the Lower Paleozoic are developed both in the Big and in the Small Karatau, where they compose the uplifted parts of the anticlinorium. In addition, in some places they come out in the cores of anticlines, the wings of which are composed of upper Lower Paleozoic rocks.

The Cambrian formations overlie the Proterozoic ones transgressively with conglomerates at the base. They are represented by various shales (sandy-argillaceous, carbonaceous-siliceous, siliceous and siliceous-carbonate) with interlayers of dolomites and phosphorites, conglomerates, sandstones, siltstones, limestones and dolomites. The total thickness of the Cambrian formations in the Greater Karatau is about 1600 m, in the Lesser Karatau the thickness of the Lower Cambrian (Karoy Formation) is 2000 m, and the Middle and Upper Cambrian-Ordovician exceeds 2700 m.

Ordovician deposits are most widely developed in the northwestern part of the ridge. Big Karatau; in the Small Karatau, they form the upper part of the undivided Tamdin Formation, composed of limestones and dolomites with a thickness of more than 2500 m. glomerates, and massive sandstones with a total thickness of more than 6000 m.

Devonian deposits within the Shu-Ili mountains are very widespread. They usually lie unconformably on Ordovician and older formations. Devonian sediments are represented in the lower part by red-colored conglomerates and sandstones with interlayers of acidic and basic volcanic rocks, which in the upper part of the section are replaced by a sequence of predominantly effusive rocks. These deposits are identified in the Sugandinsky suite, attributed to the lower-lower middle Devonian. the thickness of the deposits of this suite changes dramatically and averages up to 1500 m, but in places it sharply increases. The Upper Devonian also includes a stratigraphically higher sequence of red-colored conglomerates, sandstones, siltstones and mudstones with limestone and effusive layers, with a total thickness of up to 1000 m.

The mountain ranges of the Shu-Sarysu basin - the Ulytau, Small Karatau, Kirghiz, Shu-Ili and Kendyktas ranges are Caledonian folded structures. Chr. The Big Karatau is a Hercynian structure, and the Sarysu-Teniz watershed (uplift) is a Hercynian postgeosynclinal structure. All these folded and folded-block formations after their formation were largely reworked by subsequent tectonic movements and fragmented by numerous disjunctive faults.

Precambrian and Lower Paleozoic formations, intensely dislocated and metamorphosed, intruded by intrusions of various compositions and ages, are widespread along

the periphery of the Shu-Sarysu basin grabens. Directly in the grabens, they are part of the basement rocks penetrated by deep, parametric and structural-exploratory wells drilled in various structural conditions of the studied basin. on the basement with a deep stratigraphic break there is a sequence of diverse lithological composition: red-colored terrigenous rocks, carbonates, evaporites, etc., forming an independent structural layer - a quasi-platform one, more than 5000 m thick, which is the subject of our research. The stratigraphic volume of the rocks of the quasi-platform cover covers a complex of deposits - from the Lower-Middle Devonian to the Permian inclusive.

*Lithological-stratigraphic complexes of the quasi-platform cover.*

For basins with a Caledonian age of the basement, sedimentary filling is characterized by a wide variety of formation complexes included in it. The latter reflect the multi-stage nature of their development under constantly changing tectonic and landscape-climatic conditions. Conversely, basins with a younger age of the basement and a later time of their inception are distinguished, as a rule, by the uniformity of the formational composition of the rocks, which generally characterizes the general oscillatory movements of the earth's crust. In accordance with this, the following lithological-stratigraphic complexes (formations) are distinguished in the composition of the quasi-platform cover of the Tasbulak graben of the Shu-Sarysu basin: Upper Devonian carbonate-terrigenous-halogen; terrigenous-carbonate Lower Carboniferous; continental terrigenous Middle-Upper Carboniferous, terrigenous-halogen Lower Permian and terrigenous-carbonate Upper Permian.

*Carbonate-terrigenous-halogen complex.* The terrigenous part of the complex is widely distributed. It is known on the day surface within the northeastern zone, in the area of the Tasbulak spring, where its thickness is 1500-2000 m.

Thickness analysis shows that the areas of the Tasbulak and Kokpansor grabens, gravitating towards the northwestern half of the basin, were characterized by large downward motion gradients. It is precisely these grabens that are responsible for the formation of halogen formations that accumulated in vast lagoons during periods of rise and general shallowing of the basins.

In the Tasbulak graben and on the lower Shu saddle, the lithological composition of the lower terrigenous sequence experiences some variability. Along with this, power increases sharply.

The upper halogen sequence in its distribution is limited by the size of the salt basin. It is developed only in the northwestern part of the Shu-Sarysu basin and fills the axial, most submerged parts of the Kokpansor and Tasbulak grabens, as well as the lower Shu saddle.

By comparing lithological sections and foraminiferal assemblages from deep boreholes with well-studied sections of the Tasbulak graben and the Bestoba area, where Carboniferous deposits are subdivided into suites, an attempt was made to determine the identity of the material composition and the succession of sediments and microfauna.

*Lower Tournaisian Substage (C<sub>1t</sub>).* The Simorinsky and Kassinsky horizons are distinguished in its composition. Simorinsky Horizon (Tantai Formation). The most complete sections are described and studied along the southeastern flank of the Tasbulak graben and according to the core of the structural well No. 466 Kamenistaya. The lower boundary of the Tournaisian Stage is drawn at the base of dark gray brecciated limestones, occurring in accordance with the gradual transition to red sandstones and mudstones,



whose age, according to the remains of armored fish from the subclass Antiarchi and Antrodira, is dated to the Upper Devonian, and according to the data of miospores *Leiorites semisbugensis* Naum., *L. turbinatus* Naum. and others, found in the core of well 4 Bestobe, depth 1624-1724 m - Franco-Famennian. According to the stratigraphic position in the section, its age is determined by the Famennian stage. At the Tasbulak spring, limestones contain *Caninia cf. cornucopia* Mich., *C. ex gr. cylindricus* Scouler, *endophyllum* sp.

In well No. 446 Kamenistaya, in the depth interval of 1018-1064 m, breccia-like, dolomitic and oolitic limestones with an admixture of terrigenous material with inclusions of anhydrite and fossil salt along voids were discovered. Rare *Archaeosphaera minima* Sul. were found in microgranular limestones.

In the second half of the early Tournaisian time, due to active downward movements, the sea transgresses into the Teniz-Sarysu region, and the continental conditions of sedimentation are replaced by marine ones. The downward movements of that time had a wider regional character: they covered the entire territory of Central Kazakhstan. Within the area under consideration, the shallow sea spread to the entire Teniz and southern parts of the Shu-Sarysu basins, including the northeastern spurs of the ridge. Small Karatau. The uplifted blocks of the Caledonian basement, fragmented during the tectonic rearrangements of the Hercynian time, have been preserved in the form of separate islands in the axial part of the Shu-Sarysu basin (Kumola-Kyzylkasky, Tasta, Talas, etc.). A discontinuous band of insular uplifts extended from the southeastern end of Ulytau to the northwestern spurs of the ridge. Kyrgyz Alatau. The combination of these blocks led to the formation of two systems of grabens with a northwestern orientation - northeastern and southwestern. The first includes the Zhezkazgan, Tasbulak and Moynkum grabens, and the second includes the Kokpansor and Sozak-Baikadam grabens.

*Kassinsky Horizon* (Zhamansor Formation). Its deposits are most fully represented in the section of the Tasbulak graben, where pinkish-gray and gray brachiopod-crinoid, algal and bryozoan limestones with rare and thin interlayers of marls, siltstones with chert nodules predominate. In the limestones of the lower part of the formation, one-chamber foraminifers are widespread - *Earlandia elegans* (Raus. et reitl.), *Bisphaera malekensis* Bik., *B. minima* Lip., *B. elegans* Viss., bryozoans - *Sulcoretopora cf. curvata* Nekh., *Fenestella multispinosa* Ulr., brachiopods - *Spinulicosta arcuata* (Hall), *Spirifer kasacek* Nal., *Torinyfer cooperensis* Swall.

*Upper Tournaisian Substage* ( $C_{12}$ ). *Rusakovsky Horizon* (Koktal Formation). The sediments of the horizon under consideration lie conformably on the faunistically characterized formations of the lower tourn with a thin layer of organogenic limestone at the base. The upper part of the section is represented by gray and gray-green polymictic calcareous sandstones, pink-gray fine-grained quartz-feldspar sandstones, with interlayers of organogenic and sandy limestones containing chert nodules. In the section of the Tasbulak graben, only rare single-chamber foraminifera and quite numerous corals - *Canina cf. composita* Gorasky, *Campophyllum spumosum* Volk., *Lophophyllum tortuosum* Mich., bryozoans - *Fenestella serratulla* Ulr., brachiopods - *Plicochonetes kingiricus* Nal., *Marginatia burlingtonensis* (Hall), *Spirifer baiani* Nal.

*Visean stage* ( $C_{1v}$ ). The deposits of the Visean stage in the Tasbulak and Kokpansor grabens are characterized by the widest distribution and diversity of lithological

composition. As a rule, in most sections they are represented by carbonate sediments interbedded with sandstones, siltstones, mudstones, and carbonaceous mudstones. The predominant color is dark gray to black, alternating with greenish-gray. The division of a rather complex section into substage units according to lithological composition is associated with great difficulties. Findings of macrofauna in the core are very rare and, due to poor preservation, are practically indeterminate. The identification of substage units within the Visean Stage and the establishment of boundaries with the Serpukhovian Stage deposits was carried out according to the change of fauna and taking into account the facies features of the borehole sections. In a small core sample of organogenic limestone, foraminiferal assemblages of a certain stratigraphic level are revealed. But due to interval core sampling during drilling and the lack of rock material, some sections of the borehole sections did not receive paleontological coverage. In this case, the age of the deposits is substantiated by comparing the lithological composition with coeval deposits of the northeastern framing of the Shu-Sarysu basin (Betpak-Dala) and by position in the section. The Visean Stage is subdivided into three substages according to lithofacies features and differences in organic complexes.

*Lower Visean Substage (C<sub>IV</sub>).* Ishim Horizon (Karakol Formation). The deposits of the Karakol Formation differ significantly in their material composition and faunistic complexes from the underlying Tournaisian ones. Essentially, the section is carbonate-terrigenous, with a predominance of gray, off-white, yellow, greenish-gray quartz gravelstones, quartz and quartz-feldspar sandstones. Interlayers of spongoliths and marls are identified at the base of the section, both in the Tasbulak and Kokpansor grabens. Higher in the section, there is an alternation of dark gray silicified organogenic limestones, light gray and tobacco green polymictic sandstones, dark gray carbonaceous mudstones and marls. In the uppermost part of the section of the Ishim Horizon, ostracod and pelecypod limestones and marls are common. The sections of the Tasbulak graben and the Bestoba area have been characterized most completely faunistically. According to the core of wells 1-P Izykyr, 1-P Northern Izykyr, 2-G Western Oppak of the Tasbulak and 1-P Terekhovskaya Kokpansor grabens, a close similarity of the sections in terms of lithological composition is established, and a similar complex of foraminifers has been identified in some intervals. The silicified limestones of the lower part of the horizon are associated with single-chamber foraminifera - *Eotuberitina reitlingerae* (M.-Macl.), *Diplosphaerina minima* (Sul.), *Parathuramina aff. tuberculata* Lip., *P. aff. suleimanovi* Lip., bryozoans - *Hemitripa buralica* Nikif., *Polypora maccojaniformis* Nikif., brachiopods - *Chonetes ischimicus* Nal., *Dichthyoclostus cf. deruptus* (Rom.), *Spirifer cf. ischimicus* Litv., *Verkhotomia plena* (Hall). In the upper part of the section, the appearance of a foraminiferal complex, widely developed in younger deposits, is noted - *Pseudoglomospira gordialis* (Jon. et Park.), *endothyra prisca* Raus. et Reitl., *Pseudoammodiscus priscus* (Raus.). The composition of bryozoans and brachiopods is close to the bottom of the section. The thickness of the substage reaches 250 m.

Well 1-P Zhatyktau in the interval of 2384-2386 m passed dark gray to black, strong mudstones, splitting along subvertical filamentous cracks. They are likely to some extent able to give an idea of the lithological composition of the terrigenous part of the section of the Ishim horizon in the northeastern framing of the Tasbulak graben.

*Middle Visean Substage ( $C_{1V_2}$ ).* Yagovkinskiy Horizon (Saroiski Formation). Its deposits of predominantly carbonate composition with interlayers of marls and terrigenous rocks were exposed by deep wells in the Tasbulak and Kokpansor grabens and studied in detail on the sides of the Tasbulak graben. The identification of sediments corresponding to the average visa is justified by the change, mainly, of foraminiferal assemblages, which was expressed in a sharp renewal of the composition and an increase in its abundance. Due to the predominance of marls and ostracod limestones, the lower part of the section contains a somewhat depleted fauna of foraminifers - *Tetrataxis* sp., *ammarhaediscus* sp., poorly preserved bryozoans - *Reteporina* cf. *turkestanica* Nikif., brachiopod species are predominantly present from the deposits of the lower Vise; characteristic Middle Viseans are also noted - *Pugilis* cf. *crawfordsvillensis* (Well.), *Buxtonia* cf. *Dengisi* Nal. In the higher part of the section, in a member of intercalated carbonate and terrigenous rocks, organogenic limestones contain well-preserved foraminifers - *Omphalotis* cf. *omphalota minima* (Raus. et Reitl.), *Ammarchaediscus primaevus* (Pron.), *Archaediscus* sp., *Planoarchaediscus spirillinoides* (Raus.), Pl. aff. *spirillinoides* (Raus.) (well 1-P Izykyr, depth 3475-3580 m; well 1-P Northern Izykyr, depth 3922-4042 m; well 1-P Terekhovskaya, depth 3597-3652 m; well 466 Stony, depth 366-469 m). In the marginal outcrops of the Tasbulak Graben, the foraminiferal assemblage is supplemented by *Tetrataxis ovalis* Vdov., *Archaediscus* cf. *convexus* Grod. et Leb., *A. pauxilus* Schlyk., *Kasachstanodiscus longus* Marf., found corals - *Siphonophilla cylindrica* (Scoul.), pelecypods, better preserved brachiopods - *Productus* cf. *redesdalensis* M.-W., Pr. *productus* Sow., *Fluctuaria undata* Defr., *Spirifer kasachstanensis* Sim. The thickness of the horizon ranges from 85 to 180 m.

*Upper Visean Substage ( $C_{1V_3}$ ).* Dalnenskiy Horizon (Karatuz Formation). The section of the formation differs from the limestone-marl formations of the Yagovka horizon in terms of the predominance of limestones and the Late Visean fauna contained in them. Upper Vise sediments include dark gray almost black organogenic bituminous, detrital and microgranular limestones, with thin layers of dark gray and gray marls, mudstones and siltstones. The lower boundary is quite reasonably drawn from the appearance of the genus *Neoarchaediscus* and the accompanying foraminiferal assemblage.

In the section of the Tasbulak graben, Upper Visean deposits are also quite fully characterized by foraminifers; bryozoans - *Tabuliporella* aff. *badamica* Nikif., *T. nalivkini* Nikif., *Fenestella serratula* Ulr., brachiopods - *Avonia* cf. *joungiana* (Dav.), *Productus redesdalensis* M.-W., *Ovatia jagovkini* (Nal.). The thickness of the horizon varies from 48 to 250 m and more.

*Serpukhovian Stage ( $C_{1S}$ ).* The deposits corresponding here to the Serpukhovian are equivalent to the "Namur A" of Western Europe. Its carbonate-terrigenous formations are closely related to the Visean ones, constituting continuous marine sections and forming single structures. The division of this complex of sediments was significantly complicated due to the rarity of finds of goniatite fauna and the mixed composition of coral-brachiopod fauna. To date, from the deposits correlated with the Serpukhovian stratotype, foraminifera have been studied layer by layer, which form the basis of zonal subdivision and their interregional correlation. Within the Shu-Sarysu basin, they are identified in the volume of the Kyzyltuz Formation of the Beleuta horizon.



*Beleutinsky horizon* (lower subhorizon, Kyzyltuz Formation). At the base of the horizon, there is a fairly thick member of variegated, often red- or brown-colored fine-grained polymictic, quartz, calcareous sandstones with lenticular interlayers of pinkish-gray limestones, often containing foraminifers - *Neoarchaediscus regularis* (Sul.). Similar rocks are exposed not only on the sides of the Tasbulak graben, but wells are also exposed. 466 Stony on Ch. 267-308 m, and in other areas there is no core in the lower part of the horizon section.

In the overlying predominantly limestone stratum, dark gray organogenic-detrital, oolitic, clayey, sandy, crinoid, bryozoan-brachiopod limestones are clearly distinguished, containing thin interlayers of marls, quartz and polymictic sandstones. Limestones contain an abundance of different fauna, especially foraminifers in the side outcrops of the Tasbulak graben and in the core of the well. 466 Rocky, in the depth interval 200-267 m; in well 1-P Northern Karakoin, in the interval 1919-2343 m; in well 1-P Northern Izykyr, in the interval 3205-3372 m; in well 1-P Izykyr, in the interval 2935-3125 m; in the southern half of the Kokpansor graben in well 1-P Western Bulak, in the interval 3013-3172 m; in well 2-G Western Oppak, in the interval 1289-1417 m; in well 1-P Terekhovskaya, in the interval 3396-3400 m; in well 10-G Pridorozhnaya, in the interval 1797-1829 m. In various parts of the northwestern half of the basin. The thickness of the Serpukhovian stage ranges from 60 to 520 m.

*Middle section (C<sub>2</sub>). Bashkirian Stage (C<sub>2b</sub>). Beleutinsky Horizon* (upper subhorizon; Shu Formation). This part of the marine section in the Shu-Sarysu basin earlier, before the Serpukhovian stage was identified, belonged to the "Namur B" and was compared with coeval deposits of the Krasnopolyansky Horizon of the Russian Platform. At present, the deposits of the Krasnopolyansky horizon and its analogues are included in the base of the Bashkirian stage.

The most substantiated foraminifera sediments of the Shu Formation are identified in the Kuaral-Bestobe-Zhailyaukol structure, Tasbulak and Kokpansor grabens. The section is represented by the upper part of marine carbonate-terrigenous sediments of the Lower Carboniferous period, where among the gray, green-gray and bottle-green siltstones, organogenic limestones of the corresponding foraminiferal complex, identical in composition to the complex from the deposits of the Seslavinsky horizon of Central Asia, the Krasnopolyansky horizon of the Russian Platform, are in a subordinate amount. and others. Of these, the most characteristic are *Neoarchaediscus postrugosus* (Reitl.), *N. timanicus* (Reitl.), *N. gregorii* (Dain), *Eostaffella pseudostruvei* (Raus. et Bel.), rare brachiopods - *Spirifer bisulcatus* (Sow.). The thickness is 50-350 m. 1-P Terekhovskaya, in the interval 3155-3198 m - *Eostaffella cf. prisca ovoidea* Raus., *E. cf. ikensis* Viss., *Plectostaffella aff. varvariensis* (Brazhn. et Jarz.), *Archaediscus tumidus* Marf., *asteroarchaediscus pustulus* (Groz. et Lebed.), *Neoarchaediscus parvus* (Raus.), *N. regularis* (Sul.), *N. cf. timanicus* (Reitl.).

A typical section of these deposits was studied in the lower reaches of the Shu River (borehole 17-C, depth interval 600-900 m; near the Tasbulak spring). The lower age limit is quite reasonably determined by the wide development throughout the section of *Eostaffella postmosquensis* Kir. And

In the well 1-P Central, depth. 1730-1734 m, the composition of foraminifera differs somewhat in the presence of *Eostaffella postmosquensis* Kir., *e. pseudostruvei* (Raus. et Bel.), *E. minuta* Pot., *Neoarchaediscus paraovoides* (Brazhn.).

*Taskuduk suite.* The deposits of the Taskuduk Formation are part of the section of the Bashkirian Stage and probably represent its entire volume. They are known in the Tasbulak graben, on the Tantai-Koymas salt domes and were discovered in the Kokpansor graben of the well. 1-P Terekhovskaya and 1-P Western Bulak. The lower part of the suite is composed of green-colored polymictic sandstones, the upper part is brown-colored, with thin layers of reddish-brown gravelstones and mudstones containing marl pellets (nodular nodules). Characteristic is the presence of gray-lilac tuffs (1-2 m) in the upper part of the suite.

The most complete sections of the red-colored terrigenous complex were exposed by deep parametric and prospecting wells drilled in the Zhezkazgan, Kokpansor, Sozak-Baikadam, Moiynkum and Tasbulak grabens.

*Terrigenous-halogen complex of the Lower Permian.* At the Hercynian stage of development of the Shu-Sarysu basin, tectonic movements were significant, timed to coincide with the beginning of the Permian system.

The deposits of the Permian system are also widely developed in the northwestern half of the Shu-Sarysu basin. Tectonic movements dated to the Middle Carboniferous led to a general uplift of the inner parts of the basin. This was expressed in the change of the marine regime of sedimentation to the continental one. This manifested itself in the accumulation of a thick sequence of terrigenous red-colored sediments with layers of rock salts and subordinate interlayers of clay-carbonate rocks, characteristic of the lower parts of the Permian sections of its northwestern end. Based on the lithofacies composition and formation affiliation, the formations under consideration are divided into the Lower and Upper Permian sections.


An analysis of field geophysical data indicates the absence of a supra-salt-bearing stratum in the region of the eastern side of the Tasbulak graben (well 1-P Zhatyktau) at a thickness of a few hundred meters in its western half.

**Conclusion.** For more than 40 years of exploration history, the degree of geological and geophysical exploration of the territory of the Shu-Sarysu basin is extremely low.

In the integrated study of the basin, seismic survey data, results of drilled wells, data on gravimetric and magnetic anomalies and thermal fields, well logging data, laboratory core analysis, fluid and geochemical analyzes (including those performed abroad) and all available information stored in geological funds of the Republic of Kazakhstan.

The Shu-Sarysu basin began to form on the western margin of the Kazakhstan continental plate in the Early Devonian. Subsidence of the oceanic crust under the Kazakhstan plate led to magmatic intrusion and volcanic activity in areas located to the south and east of the Shu-Sarysu basin. Subsequently, during the entire Late Paleozoic, it was from these regions that clastic material entered the basin. During the Triassic and Jurassic, the Shu-Sarysu basin became an uplift zone in the inner part of the Asian continent. The deposits of the Cretaceous and Tertiary periods within its limits are relatively thin and are not included in the hydrocarbon system of the basin.

The basement of the depression is consisting of the mostly by Precambrian sediments. These are mainly a dislocated and intruded formations. Comparison of the section in the Kokpansor graben penetrated by parametric wells with those of individual wells drilled in the Tasbulak graben indicates a satisfactory correlation of all Paleozoic systems within

the northwestern part of the Shu-Sarysu basin. In accordance with this, the following lithological-stratigraphic complexes (formations) are distinguished in the composition of the quasi-platform cover of the Tasbulak graben of the Shu-Sarysu basin: Upper Devonian carbonate-terrigenous-halogen; terrigenous-carbonate Lower Carboniferous; continental terrigenous Middle-Upper Carboniferous, terrigenous-halogen Lower Permian and terrigenous-carbonate Upper Permian. 

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