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ХАБАРЛАРЫ

ИЗВЕСТИЯ

РОО «НАЦИОНАЛЬНОЙ
АКАДЕМИИ НАУК РЕСПУБЛИКИ
КАЗАХСТАН»
ЧФ «Халық»

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Қазақстан Республикасы Ұлттық ғылым академиясы «ҚР ҰҒА Хабарлары. Геология және техникалық ғылымдар сериясы» ғылыми журналының Web of Science-тің жаңаланған нұсқасы Emerging Sources Citation Index-те индекстелуге қабылданғанын хабарлайды. Бұл индекстелу барысында Clarivate Analytics компаниясы журналды одан әрі the Science Citation Index Expanded, the Social Sciences Citation Index және the Arts & Humanities Citation Index-ке қабылдау мәселесін қарастыруда. Webof Science зерттеушілер, авторлар, баспашылар мен мекемелерге контент тереңдігі мен сапасын ұсынады. ҚР ҰҒА Хабарлары. Геология және техникалық ғылымдар сериясы Emerging Sources Citation Index-ке енуі біздің қоғамдастық үшін ең өзекті және беделді геология және техникалық ғылымдар бойынша контентке адалдығымызды білдіреді.

НАН РК сообщает, что научный журнал «Известия НАН РК. Серия геологии и технических наук» был принят для индексирования в Emerging Sources Citation Index, обновленной версии Web of Science. Содержание в этом индексировании находится в стадии рассмотрения компанией Clarivate Analytics для дальнейшего принятия журнала в the Science Citation Index Expanded, the Social Sciences Citation Index и the Arts & Humanities Citation Index. Web of Science предлагает качество и глубину контента для исследователей, авторов, издателей и учреждений. Включение Известия НАН РК. Серия геологии и технических наук в Emerging Sources Citation Index демонстрирует нашу приверженность к наиболее актуальному и влиятельному контенту по геологии и техническим наукам для нашего сообщества.

ЧФ «ХАЛЫҚ»

В 2016 году для развития и улучшения качества жизни казахстанцев был создан частный Благотворительный фонд «Халык». За годы своей деятельности на реализацию благотворительных проектов в областях образования и науки, социальной защиты, культуры, здравоохранения и спорта, Фонд выделил более 45 миллиардов тенге.

Особое внимание Благотворительный фонд «Халык» уделяет образовательным программам, считая это направление одним из ключевых в своей деятельности. Оказывая поддержку отечественному образованию, Фонд вносит свой посильный вклад в развитие качественного образования в Казахстане. Тем самым способствуя росту числа людей, способных менять жизнь в стране к лучшему – профессионалов в различных сферах, потенциальных лидеров и «великих умов». Одной из значимых инициатив фонда «Халык» в образовательной сфере стал проект Ozgeris powered by Halyk Fund – первый в стране бизнес-инкубатор для учащихся 9-11 классов, который помогает развивать необходимые в современном мире предпринимательские навыки. Так, на содействие малому бизнесу школьников было выделено более 200 грантов. Для поддержки талантливых и мотивированных детей Фонд неоднократно выделял гранты на обучение в Международной школе «Мирас» и в Astana IT University, а также помог казахстанским школьникам принять участие в престижном конкурсе «USTEM Robotics» в США. Авторские работы в рамках проекта «Тәлімгер», которому Фонд оказал поддержку, легли в основу учебной программы, учебников и учебно-методических книг по предмету «Основы предпринимательства и бизнеса», преподаваемого в 10-11 классах казахстанских школ и колледжей.

Помимо помощи школьникам, учащимся колледжей и студентам Фонд считает важным внести свой вклад в повышение квалификации педагогов, совершенствование их знаний и навыков, поскольку именно они являются проводниками знаний будущих поколений казахстанцев. При поддержке Фонда «Халык» в южной столице был организован ежегодный городской конкурс педагогов «Almaty Digital Ustaz.

Важной инициативой стал реализуемый проект по обучению основам финансовой грамотности преподавателей из восьми областей Казахстана, что должно оказать существенное влияние на воспитание финансовой грамотности и предпринимательского мышления у нового поколения граждан страны.

Необходимую помощь Фонд «Халык» оказывает и тем, кто особенно остро в ней нуждается. В рамках социальной защиты населения активно проводится

работа по поддержке детей, оставшихся без родителей, детей и взрослых из социально уязвимых слоев населения, людей с ограниченными возможностями, а также обеспечению нуждающихся социальным жильем, строительству социально важных объектов, таких как детские сады, детские площадки и физкультурно-оздоровительные комплексы.

В копилку добрых дел Фонда «Халык» можно добавить оказание помощи детскому спорту, куда относится поддержка в развитии детского футбола и карате в нашей стране. Жизненно важную помощь Благотворительный фонд «Халык» оказал нашим соотечественникам во время недавней пандемии COVID-19. Тогда, в разгар тяжелой борьбы с коронавирусной инфекцией Фонд выделил свыше 11 миллиардов тенге на приобретение необходимого медицинского оборудования и дорогостоящих медицинских препаратов, автомобилей скорой медицинской помощи и средств защиты, адресную материальную помощь социально уязвимым слоям населения и денежные выплаты медицинским работникам.

В 2023 году наряду с другими проектами, нацеленными на повышение благосостояния казахстанских граждан Фонд решил уделить особое внимание науке, поскольку она является частью общественной культуры, а уровень ее развития определяет уровень развития государства.

Поддержка Фондом выпуска журналов Национальной Академии наук Республики Казахстан, которые входят в международные фонды Scopus и Wos и в которых публикуются статьи отечественных ученых, докторантов и магистрантов, а также научных сотрудников высших учебных заведений и научно-исследовательских институтов нашей страны является не менее значимым вкладом Фонда в развитие казахстанского общества.

С уважением,
Благотворительный Фонд «Халык»!

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Satbayev University, 22 Satpaev St., Almaty, Kazakhstan.
E-mail: *k.togizov@satbayev.university*

SEISMIC DATA DYNAMIC INTERPRETATION IN THE STUDY OF THE LATERAL VARIABILITY OF PETROLEUM BEARING TERRIGENOUS RESERVOIRS

Niyaz Assel Temirkhankyzy — Master's student, Satbayev University
E-mail: *aselnzv@gmail.com.* ORCID ID: https://orcid.org/0009-0001-4900-4198;
Kuanysh Togizov — PhD, Professor, Satbayev University
E-mail: *k.togizov@satbayev.university*. ORCID ID: https://orcid.org/0000-0002-4830-405X;
Istekova Sara — Doctor of «Geological and Mineralogical Sciences», Professor, Satbayev University
E-mail: *istekovy@mail.ru.* ORCID ID: https://orcid.org/0000-0003-4298-7598.

Abstract. The article demonstrates the effectiveness of dynamic interpretation of seismic data in the study of terrigenous reservoirs formed under complex mining and geological conditions. Using the example of one of the oil fields, located within the Peri-Caspian oil and gas bearing province, at the junction of two large structural and tectonic elements of the earth's crust - the Peri-Caspian and the North-Ustyurst Depressions, on local structures complicated by numerous faults, the results of detailed seismic studies using modern technologies for processing and interpretation of the field data. Based on reprocessing, dynamic processing and reinterpretation of seismic data previously performed in different years, cubes of attributes PIMP (longitudinal seismic impedance), LaRho, Vp / Vs, and pseudoporosity were obtained and a deep seismic geological model was built, which determined the structural and stratigraphic features of oil and gas complexes in the Jurassic deposits. A comprehensive analysis of seismic and well data with extensive use of the supreme materials on drilling and the analysis results of the reservoir exploration revealed the opportunities to identify new prospective exploration targets in terrigenous strata, to determine the reservoir parameters for recalculating reserves and further adjusting exploration of the reservoir.

Key words: petroleum bearing reservoirs, seismic exploration, geophysical well surveys, dynamic interpretation, attributes, pseudoporosity cube

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Сәтбаев университеті, Сатпаев көш. 22, Алматы, Қазақстан.
E-mail: *k.togizov@satbayev.university*

МҰНАЙ ЖӘНЕ ГАЗ БАР ТЕРРИГЕНДІК КОЛЛЕКТОРДЫҢ ЛАТЕРАЛДЫҚ ӨЗГЕРІСТЕРІН СЕЙСМИКАЛЫҚ МӘЛІМЕТТЕРМЕН ЗЕРТТЕУ АРҚЫЛЫ ДИНАМИКАЛЫҚ ТҮСІНДІРУ

Асель Нияз Темирханқызы — магистрант, Сәтбаев университеті
E-mail: *aselnzv@gmail.com*. ORCID ID: https://orcid.org/0009-0001-4900-4198;
Қуаныш Тоғызов — PhD, профессор, Сәтбаев университеті
E-mail: *k.togizov@satbayev.university*. ORCID ID: https://orcid.org/0000–0002–4830–405X;
Сара Истекова — геология минералогия ғылымдарының докторы, профессор, Сәтбаев университеті
E-mail: *istekovy@mail.ru*. ORCID ID: https://orcid.org/0000-0003-4298-7598.

Аннотация. Мақалада күрделі геологиялық жағдайларда қалыптасқан терригендік коллекторларын зерттеуде сейсмикалық мәліметтер арқылы динамикалық түсіндірудің тиімділігі көрсетілген. Каспий маңындағы мұнай-газ провинциясының шегінде жер қыртысының екі ірі құрылымдық-тектоникалық элементтері – Каспий маңы және Солтүстік Үстірт ойпаттарының түйіскен жерінде, көптеген жарылыстармен күрделенген жергілікті құрылымдарда орналасқан кен орнындарының бірі мысалға ала отырып, деректерді өңдеу және интерпретациялау үшін заманауи технологияларды қолдану арқылы сейсмикалық зерттеулер жүргізілді. Бұрын орындалған сейсмикалық деректерді қайта өңдеу, динамикалық өңдеу және қайта интерпретациялау негізінде PIMP (бойлық сейсмикалық кедергі), LaRho, Vp/Vs және жалған кеуектілік атрибуттарының мәліметері алынды және тереңдік сейсмикалық геологиялық модель салуға мүмкіндік берді. Юра шөгінділеріндегі мұнай-газ кешендерінің құрылымдық және стратиграфиялық ерекшеліктерін анықтау. Соңғы бұрғылау материалдары қолдана отырып, сейсмикалық және ұңғыма деректерін кешенді талдау және кен орындарын игеруді талдау нәтижелері терригендік қабаттардағы жаңа перспективті объектілерді анықтауға, қоллекторды қайта есептеу және кен орындарын игеруді одан әрі түзету үшін коллектордын параметрлерін анықтауға мүмкіндік берді.

Түйінді сөздер: мұнай және газ коллекторлары, сейсмикалық барлау, ұңғымалардың геофизикалық зерттеулері, динамикалық интерпретация, атрибуттар, жалған кеуектілік кубы

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Сатпаев Университет, Алматы, Казахстан.
E-mail: *k.togizov@satbayev.university*

ДИНАМИЧЕСКАЯ ИНТЕРПРЕТАЦИЯ СЕЙСМИЧЕСКИХ ДАННЫХ ПРИ ИЗУЧЕНИИ ЛАТЕРАЛЬНОЙ ИЗМЕНЧИВОСТИ НЕФТЕГАЗОНОСНЫХ ТЕРРИГЕННЫХ КОЛЛЕКТОРОВ

Асель Нияз Темирхановна — магистрант «Нефтегазовая и рудная геофизика», Satbayev University, Алматы Казахстан
E-mail: *aselnzv@gmail.com*. ORCID ID: https://orcid.org/0009-0001-4900-4198;
Куаныш Тогизов — PhD, профессор Satbayev University, Алматы Казахстан
E-mail: *k.togizov@satbayev.university*. ORCID ID: https://orcid.org/0000–0002–4830–405X;
Сара Истекова — доктор геолого-минералогических наук, профессор Satbayev University, Алматы Казахстан
E-mail: *istekovy@mail.ru*. ORCID ID: https://orcid.org/0000-0003-4298-7598.

Аннотация. В статье демонстрируется эффективность динамической интерпретации сейсмических данных при изучении терригенных коллекторов, сформировавшиеся в сложных горно-геологических условиях. На примере одного нефтяного месторождения, расположенного в пределах Прикаспийской нефтегазоносной провинции, на стыке двух крупных структурно-тектонических элементов земной коры – Прикаспийской и Северо-Устюрсткой впадин, на локальных структурах, осложненных многочисленными разломами проанализированы результаты детальных сейсмических исследований с применением современных технологий обработки и интерпретации полевых данных. На основе переобработки первичных данных, динамической обработке и переинтерпретации выполненных ранее в разные годы сейсмических данных получены кубы атрибутов PIMP (продольный сейсмический импеданса), LaRho, Vp/Vs, и псевдопористости и построена глубинная сейсмогеологическая модель, которая позволила определить структурные и стратиграфические особенности нефтегазоносных комплексов в юрских отложениях. Комплексный анализ сейсмических и скважинных данных с широким использованием последних материалов бурения и результатов анализа разработки месторождения позволили выделить новые перспективные объекты в терригенных толщах, определить параметры коллекторов для переподсчета запасов и дальнейшей корректировки разработки месторождения.

Ключевые слова: нефтегазоносные коллекторы, сейсморазведка, геофизические исследования скважин динамическая интерпретация, атрибуты, куб псевдопористости

Introduction

At determining design parameters for hydrocarbon deposits calculation characterized by a complex geological structure, these parameters may cause issues due to their

strong variability in area and depth. It is known that a comprehensive interpretation of seismic and well data includes development of structural-tectonic models (kinematic interpretation) and studying the properties and structure of productive formations in terms of the area and interwell space (dynamic interpretation) (Votsalevsky, 1999 a, 1993 b). The physical basis of dynamic interpretation is that the seismic waves attributes used are associated with the rocks properties: reflection amplitudes are associated with contrasts of acoustic rigidities at the boundaries of layers, frequencies are associated with the thickness of layers and their lithological composition, phases respond to the nature of interlayering: wave extrema are associated with contrasting boundaries, while the phase shift of the reflection is due to interference from the interlayer thickness (Aliakbar, 2023: 9).

At the stage of dynamic interpretation, considering the differentiation of elastic properties of sedimentary complexes, it is possible to predict reservoir properties and fluid saturation based on the detailed seismic data in the areas remote from drilled wells. The use of up-to-date methods of the dynamic wave field analysis allow obtaining the acoustic parameters of target formations with sufficiently high accuracy and to establish reliable correlations between the predicted acoustic and capacitive parameters of reservoirs over the entire distribution area of the productive horizons (Daukeev, 2002; Tileuberdi, 2021: 7). Nowadays, there are new advances in seismic interpretation packages that include advanced structure-based cube filtering technologies to improve the imaging of thin faults and linear discontinuities. For example, such technologies as the preliminary application of a tilt control cube, fault enhancement filters, which application is followed by an enhancement of seismic attributes of faults (similarity, curvature, coherence) and provide better visualization of fault lineaments and subtle heterogeneities. The development of Schlumberger Software is known as “Ant tracking" for emphasizing faults, cracks and other linear discontinuities within the seismic cube.

Linking productive intervals identified according to drilling and well log survey (WLS) with the results of dynamic interpretation of seismic data, tracking linked data by area, detailed description of the oil and gas deposits parameters (dimensions, estimated area, reservoir properties), at the present stage of study, are becoming increasingly important, especially in severe mining and geological conditions of the hydrocarbon deposit formations.

The statistical analysis of the elastic properties of the formations exposed in wells is carried out to assess the accuracy of the reservoir quality forecast and to identify the degree of risks associated with the uncertainty of the geophysical methods and geological conditions, and its results are used for probabilistic prediction and classification of lithology and fluids based on synchronous inversion of seismic and well data (Yilmaz, 2001; Nanda, 2016).

Materials and principal methods

Characteristics of the initial data. Reprocessing, dynamic processing and reinterpretation of seismic data with the use of the recent results obtained from drilling and development carried out at the Kultuk deposit in order to obtain data for recalculating reserves.

According to the latest structural constructions, one of the oil fields of the Primorsky zone is divided into two fields: The Western and the Eastern, the arches of which at different levels do not coincide in the plan. According to the Callovian horizon, the arch of the Western flank is much wider than the arch of the Eastern flank. The western field is a brachyanticlinal fold, elongated in the southwestern direction and complicated by low-amplitude tectonic disturbances F 1, F 2, f 2, f 3, f 4, f 5, forming separate tectonic traps. The eastern field is an anticlinal fold, also complicated by tectonic disturbances F 3, f 6, f 8. (Fig. 1)

The deposit has been formed on local uplifts, which owe their formation to numerous faults, most likely of strike-slip origin, and is located at the junction of large structural-tectonic elements of the earth's crust - the Peri-Caspian and the North-Ustyurst Depressions, and the location of the faults along the NE-SW strike may indicate the presence here of a right-hand horizontal shift in the foundation. The initial idea that the deposit is an integral reservoir confined to a single anticlinal structure, even taking into account its block structure, was not confirmed by results of drilling. Within the Kultuk deposit according to drilling data, seismic surveys, WLS complex and sampling, the established were the oil-saturated reservoirs in the horizons U-I (A and B beds) and U- VII in Middle Jurassic deposits (Bajocian and Callovian productive horizons). The deposits are limited by tectonic disturbances; according to the type of reservoir they are classified as strata, domed, tectonically and lithologically shielded.

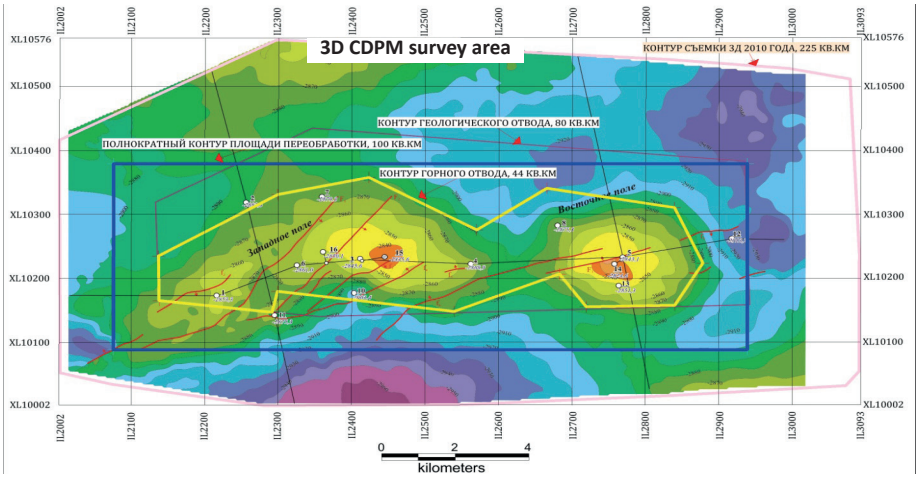
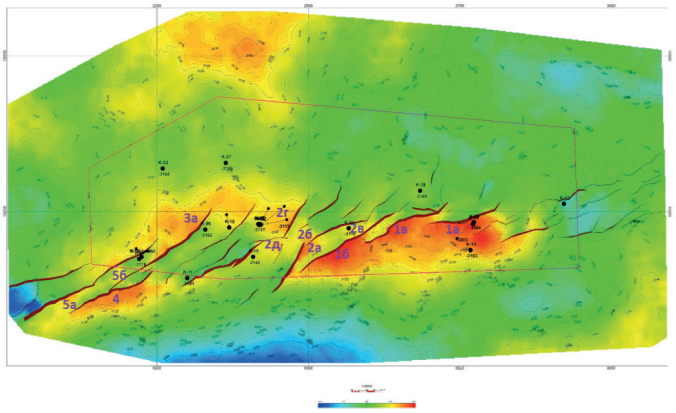


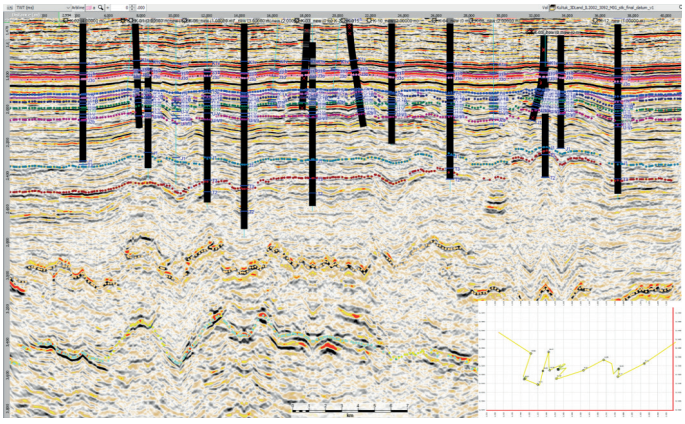
Fig. 1 Contour Map of the Deposit

The rocks of the productive horizons are represented by sandstones with interlayers of siltstones and mudstones. Based on the type of pore space, they belong to the pore type reservoir.

Research methodology. 3D CDPM field seismic surveys were carried out on the deposit area and its surroundings, resulting in a cube in the time domain. The study area is characterized by complex surface conditions and is divided into land, shallow water with a water depth of up to 2 m and the sea part (Fig. 2).



The contour map tile along reflecting horizon IV_3 (reflecting horizon along the top of the Bajocian stage).



Composite seismic section through tied wells

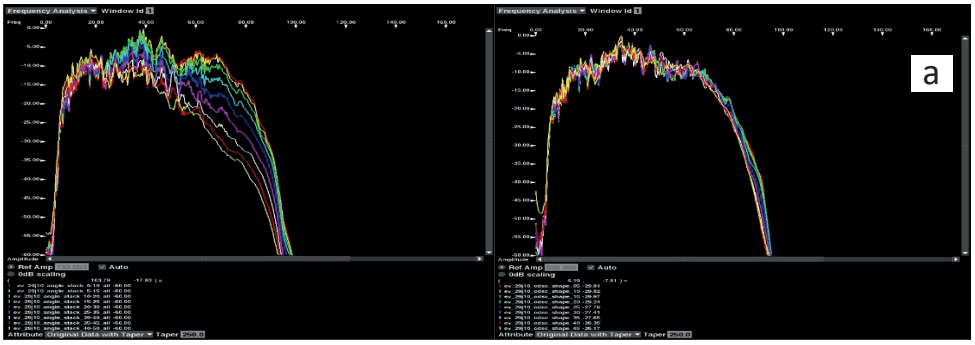
Fig.2. Results of seismic studies of the study area

The first processing of 3D seismic data was carried out using the pre-stack time migration technique. The quality of this processing is satisfactory for preliminary contour mapping of the main seismic horizons. However, it was not sufficient for dynamic analysis and prediction of lateral changes in the properties of productive intervals. The main disadvantage of this processing was the presence of multiples and peg-leg multiples background in the target Jurassic interval of the section. Especially many multiple waves were observed in the middle and lower parts of the Jurassic section, so even the structural interpretation of horizons in the Middle Jurassic and the top of the Triassic was difficult and ambiguous. Inadequate lateral equalization of amplitudes had a strong impact on the dynamics of reflections.

To eliminate the above problems, the work was carried out on reprocessing, dynamic processing and reinterpretation of seismic data to the extent necessary to prepare data for reserve recalculation with the use of the latest drilling materials and development analysis. Data processing for dynamic interpretation (RESOP) was aimed at the improvement of the quality and resolution of the outcomes of inversion technologies and the mission-specific processing prior to summation and optimization of the final angle stacks at the input of dynamic inversion.

The basic composition of the processing procedures was aimed *at*: suppressing residual interference, straightening the hodographs of reflected waves in the maximum range of offsets, processing the signal shape taking into account the effects of dispersion and absorption, while maintaining the natural gradient of signal amplitudes with offset.

As is known, the shape of a seismic pulse changes with increasing distance from the shot point (SP-RP). This is due both to physical phenomena that arise when an acoustic pulse passes through rocks (amplitude absorption and dispersion effects) and to the presence of residual interference at some distance ranges. In addition, the effect of "stretching" the pulse at long distances (at large angles of incidence) arose, when introducing kinematic corrections. The main task of this processing stage was to compensate (at least partially) these effects. To solve this problem, the ODSC (Offset Dependent Spectral Correction) procedure was used. At the first stage, the shape of the seismic pulse, characteristic of each angle of incidence, was assessed. Next, a reference angle is selected and filters are calculated that bring the spectrum of each angle to the reference angle, i.e. for each angle, one filter was applied to the entire area, thereby making no changes over the area, preserving the anomalies of interest (Fig. 3.).



a – before the correction filter.; b - after the correction filter.

Fig. 3. Analysis of frequencies depending on offset before and after applying the correction filter

Data processing, carried out while preserving true amplitudes in a wide frequency range, provided the necessary signal-to-noise ratio and resolution, allowing to solve the assigned geological problems. The use of 3-dimensional selections and corresponding procedures to take into account the volumetric nature of noise when constructing interference models had a positive effect. Noise reduction was tested in different parts of the area, in different sortings (cross-spreads, CMP, general vector plans) and the optimal noise reduction parameters were selected for the entire area. Noise models were subtracted using a state-of-the-art adaptive subtraction algorithm.

During processing, a wide frequency range was preserved for further dynamic interpretation (inversion transformations, etc.). Three iterations of velocity analysis with the account of the interval velocity inversions, as well as high-precision automatic velocity analysis at the final stage, allowed to obtain a high-quality velocity model. Two iterations of accounting residual static corrections and additional residual statics for the

first arrivals were performed, which contributed to improving the structural geometry. At the final stage, special data processing was performed for the purposes of dynamic interpretation.

The analysis resulted in the following cubes:

1) Coherence cube. Used for tectonic analysis.

2) Spectral decomposition. It was used both for tectonic analysis and for identifying geological bodies (paleochannels, etc.).

3) A set of instantaneous attributes (amplitude, frequency, phase, sweetness).

To assess filtration and capacitance properties, the most used were the results of synchronous inversion.

Specialized dynamic processing was carried out using *the method of full synchronous inversion before* summation with the output of all properties Ip, Is, ρ, Vp, Vs, Vp / Vs, Poisson's and Lamé's ratios. Specialized processing included the following procedures:

-additional noise suppression (if necessary).

- correction of the frequency spectrum of the signal depending on the distance; obtaining angle stacks;

- quality control;

- recording of angle stacks in SEG - Y format;

- alignment of the signal shape with offset.

Inversion based on the PMLP maximum likelihood algorithm was widely used, as well as post-stack processing technologies aimed at improving the quality of interpretation for identifying thin layers and faults.

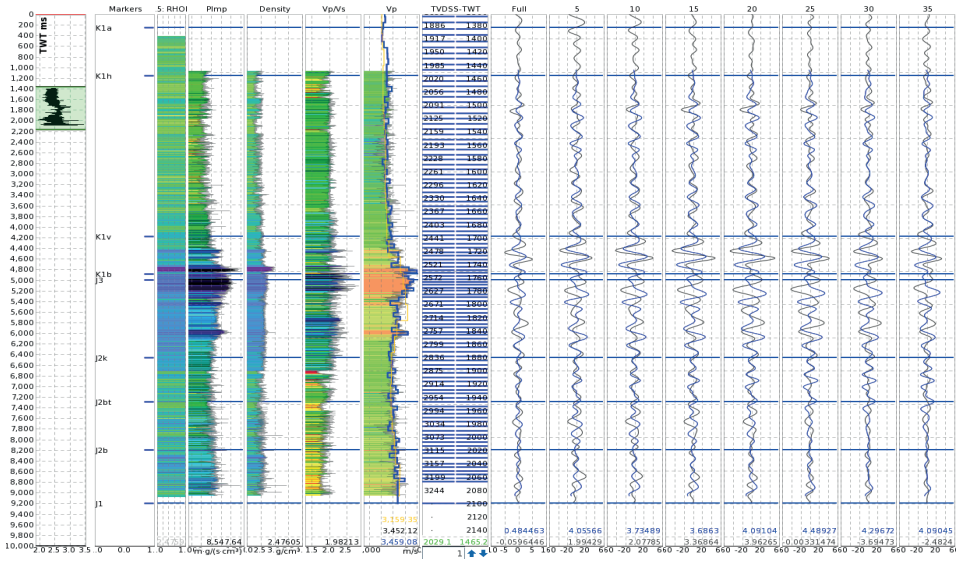
At the Kultuk deposit, the productive intervals of the target Jurassic horizon are connected by thin layers of sand reservoirs. Therefore, the Seismic Spectral Bluening (SSB) method was used, aimed at enhancing attenuated and masked high frequencies from the entire dynamic range of the seismic record. Post-processing of the seismic cube using the "Structure-Based Filtering of the Total Cube by Integrating Various Seismic Fracture Attributes" method is used to enhance subtle structural features of the wave field to identify thin faults and fractures with offset amplitudes below the resolved capability of the seismic data.

Combining the results of seismic inversion and information about the elastic characteristics of the medium at well points, both a qualitative and quantitative forecast of the effective parameters of the studied formations was made in two-dimensional and in three-dimensional versions, with a probabilistic assessment of the obtained forecast. In addition, all geological and geophysical materials obtained from previous studies were used to clarify the geological structure of the work area, to identify prospective exploration targets and to determine calculation parameters.

The quantitative interpretation of seismic data (dynamic interpretation) is based on petrophysical statistical modeling to determine the characteristics and relationships of combinations of lithology and fluid saturation depending on the rock type, fluid content, quality and depth of the reservoir. Subsurface trend analysis is a standard part of the petrophysical research workflow.

Trends in the rock elastic properties as a function of depth were determined using

logging information. To do this, the petrophysical lithological models were previously interpreted, fluid replacement was performed and shear wave velocity information was modeled for three wells with the most modern logging records. The elastic property trends were developed through a detailed interpretation of the log data, when finite intervals (i.e., extreme values) were picked, scaled, and plotted on a cross-relationship diagram. The finite elements were determined to be the purest examples of the lithology present based on the interpretation of all relevant logs. This is indirectly based on mineralogy (Fig. 4).



Blue trace is synthetic, black is seismic trace of angle stack

Fig.4. Result of linking well data and angle stacks

Depth-dependent finite elements of elastic property trends, which reflect mean and inherent scatter values, were calculated from summary elastic property plots. These trends were further used to probabilistically model various lithology-fluid combinations, test the sensitivity of important variables, and evaluate discrimination in rock properties and seismic attributes. The use of finite elements and the structuring of a depth-dependent parameter model is critical to quantifying the spread parameters of the resulting properties, and it is also important to understand the range of seismic responses (and associated inversion derivatives) that can be observed. Finite element fluid properties have also been analyzed for use in fluid replacement studies using the Gassmann principle, where the elastic response is modeled for different fluid saturation scenarios rather than using actual fluid data (Keshavarazian, 1985; Saiidi, 1979; Umemura, 1974).

The modeling results made it possible to establish that for the analyzed deposit, clays and sandstones have a similar range of longitudinal wave speed and longitudinal impedance, from which we can conclude that the presence of longitudinal impedance

is not enough for the attribute analysis. Even hydrocarbon-saturated intervals have the same range. But the Vp/Vs ratio has more ability to discriminate between clays and sandstones, and at best can be an indicator of fluids. As a result, to analyze the physical properties of rocks at the Kultuk site, the inversion attributes VpVs and LaRho, as well as the calculated pseudoporosity cube Kpo, obtained as a derivative of the inversion attributes, were used.

The basis for the geological justification of the dynamic interpretation of seismic data was sedimentological models and facies maps obtained during the detailed sedimentological analysis of the study area. To map the boundaries of the distribution of the identified facies in the inter-well space, the applied were the widely used methods of section classification according to the routing shape, analyzing the dynamic characteristics of the section, frequency decomposition cubes, as well as seismic inversion. The seismic inversion allowed to obtain the most reliable idea of the structure of the strata being studied.

The obtained results of the dynamic analysis of seismic signals afforded to forecast reservoir properties and fluid saturation at certain distances from drilled wells. At the same time, the accuracy was assessed for this forecast and the risks associated with the uncertainty of the geophysical methods themselves (remote sensing data used, seismic exploration) and the geological conditions (drilling results). The statistical analysis of the rocks elastic properties exposed in wells was carried out for this purpose, its results were used for probabilistic prediction and classification of lithology and fluids based on the results of synchronous inversion.

Results

The geometry of geological bodies and their possible reservoir properties were obtained as a result of interpretation based on a comparison of the pseudoporosity attribute section with the RMS and coherence sections within the sediments of the Bajocsian and Callovian-Bathonian complexes of the Middle Jurassic. Sections *of the Bajocian complex of Middle Jurassic rocks* quite contrastingly displayed some isometric geological bodies, in the western and eastern parts of the sections under consideration, which, apparently, are the flow complexes (the possible direction is indicated by arrows). Since the conditions of sedimentation and the direction of possible sediment transport within this complex of rocks (Bajossian complex) differ from the previously described conditions expressed in the Callovian and partially Bathonian complexes, it is permissible to assume that the main tectonic development of the Middle Jurassic complex, which led to the partial erosion of the Callovian deposits, occurred later and in age comparable to the Callovian-Bathonian time, which in turn proves the synsedimentary nature (in relation to the complex of Callovian-Bathonian deposits) of tectonic disturbances. The direction of sediment transport, within the stratigraphic unit under consideration, is both in the southern - southwestern and eastern - southeastern directions (possible flow deposits). “Warm” colors on a section based on the pseudoporosity attribute indicate relatively increased (improved) reservoir properties, which allows a more accurate approach to identifying relatively potential areas within the horizon under consideration, in conjunction with the current structural geometry, of course. Figure 5, as an example,

shows a comparison of a section fragment based on the pseudoporosity attribute and well data. In this case, fragments of GWL tablets for two wells are presented. According to the pseudoporosity section, well 1 falls into the zone of improved reservoir properties, which in turn is associated with the flow complex (temporary flow). This body can also be traced on the plot of well 1. Well 2, as per section of the pseudoporosity attribute, falls in the area of deteriorated reservoir properties, which apparently indicates that the well is located outside of this flow complex. Well 2 tablet confirms this fact, due to the absence of an incised rock complex.

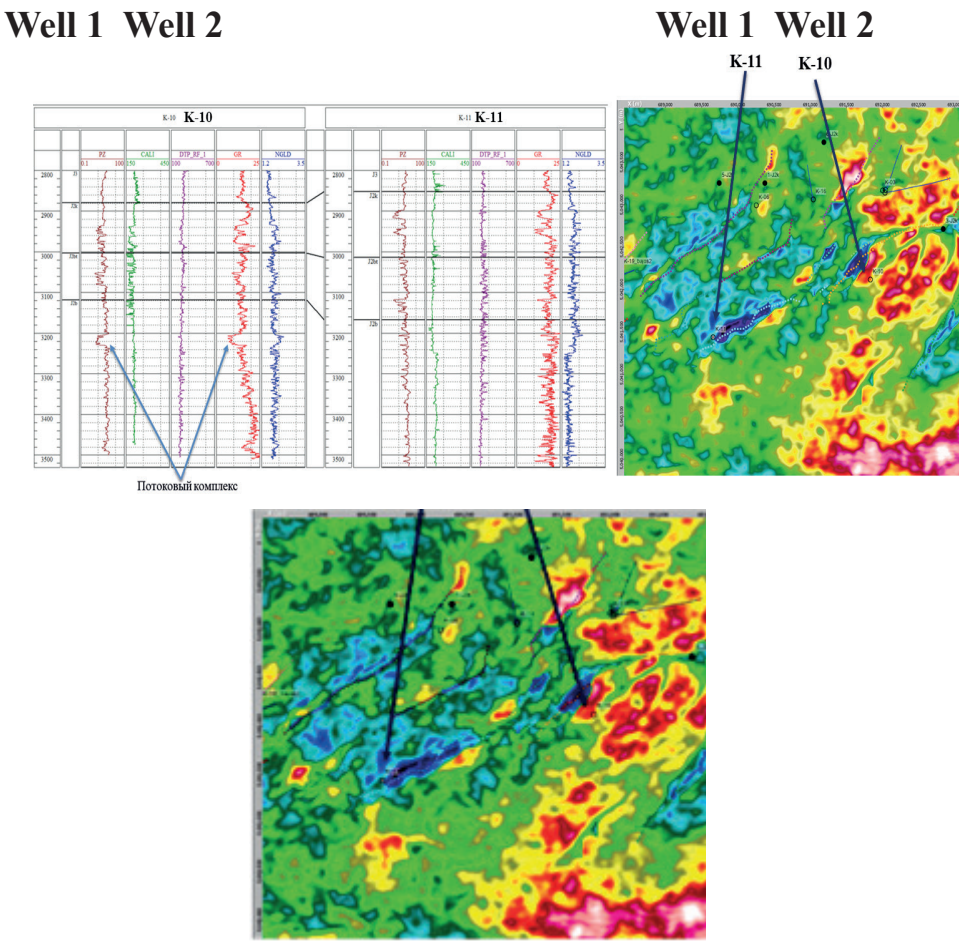


Figure 5. Comparison of a section fragment of the pseudoporosity attribute and well data

Conclusion

The seismic exploration methods are the main information base in the preparation and justification of promising objects, determining the optimal placement of design deep wells and often assessing the properties of reservoirs. In this regard, application of the

innovative technologies in processing and interpretation of seismic data (2D and 3D - CDPM) at the present stage of study is becoming of great importance. The efficiency of applying the most momdern seismic data processing techniques, special noise reduction procedures, velocity analysis, recent developments in interpolation of missing data and adaptive subtraction of noise models from data allowed us to achieve good results.

Currently, in Kazakhstan, the innovative technologies in the processing and interpretation of seismic data (2D and 3D - CDP) are widely used in studying gas-and-oil bearing reservoirs. Modern seismic exploration integrated with well data, based on establishing the relationship between petrophysical parameters and seismic attributes, allows to obtain the necessary information on the lateral and vertical variability of the oil and gas reservoirs, which serves as the basis for the detailed three-dimensional geological modeling and identification of productive horizons with improved reservoir properties.

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