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THE ORIGIN OF THE DEPRESSION LAKE SYSTEMS TENIZ NORTHERN KAZAKHSTAN

Abstract. The article discusses the origin of the system of peculiar lake basins of Northern Kazakhstan, called tenis - steppe seas, due to the vast areas. With deep incision of the basins of the shadows, so that the water level marks in them are below the edge in the Irtysh channel at the same latitudes, the depths of the highly saline lacustrine water column are insignificant. The article provides a review of the views of many authors on the genesis of tenises: L.S. Berg, Ya.S. Edelstein, A.S. Kes, K.N. Pestovsky, E.N. Posokhova, I.A. Volkov, who linked their origin with various exogenous processes: the remainder of the Oligocene sea or a huge ancient stream, the result of leaching of salts followed by compaction of rocks and deflation, inter-delta depressions, sor-deflation troughs, and others V.V. Goian (1968) for the first time came to the conclusion that tectonic processes are the main factors in the formation of the basins of shadows. The reconstruction of the buried topography according to drilling data confirmed the findings of V.V. Goian. The crystalline basement of the territory for the development of tenises is fragmented into separate blocks that have shifted relative to each other, and the basins of tenises are confined to tectonic depressions.

Keywords. Tenizas - steppe seas, tectonic depressions, lakes, basins, origin.

One of the features of the flat territory of the north-eastern outskirts of the Republic of Kazakhstan is the presence of a system of peculiar basins of salt and bitter-salt lakes, which are called tenis - steppe seas (Seleteniteniz, Ulkenkara, Teke, Kyzylkak, Kishikara, Shaglyteniz, etc.). These lakes have huge water areas, a large incidence of basins relative to the general surface of the plain with relatively insignificant water thicknesses, so that the water level marks in them are below the water edge in the Irtysh channel at the same latitudes.

The plain territory of the north-eastern outskirts of the Republic of Kazakhstan occupies a border position between the Omsk Depression of the West Siberian Plain and the slopes of the Kazakh small hills - the Kazakh folded country of Sary-Arka. The dividing spaces between the lake basins are represented by a wide wave plain, where the relative elevations barely reach 10-15 m. The absolute heights of the plain, generally inclined to the north-east towards the Omsk Depression, are about 120-135 m. Wide flat ridges stand out in the relief of the plain and the same wide, indistinctly shaped hollow depressions, in the bottoms of which there are small lakes, often in the form of chains. The slopes of the shadows of the shadows are cut by numerous valleys of mainly temporary watercourses.

The boundary position of the territory under consideration determined the nature of its structural elements, the history of tectonic development, the geological structure, which are reflected in the features of the modern relief, including those related to the origin of shadows. The boundary position at the junction of large tectonic structures of the Epigercin West Siberian Plate and the Paleozoic Kazakh Shield, experiencing multidirectional movements of the opposite sign along the vertical, for many tens of millions of years contributed to long-term stresses that cause discontinuous discontinuities in the rocks of the crystalline basement. These processes led to the fragmentation of the crystalline rocks of the basement into a system of blocks, the multidirectional movements of which led to the presence of a very dynamically

developing structure that lies at the base of the territory under consideration. Raises of the Kazakh shield, accompanied by concomitant denudation processes, and the immersion of the West Siberian plate, accompanied by accumulation processes, turned this structure into a transit zone of the lithodynamic flow, which has a direction in the direction of the Omsk Depression (Omsk syncline). The structure of the foundation can be traced in all horizons of the platform cover and grows due to the northeast border of the Prikazakhstan monocline. According to F. Zh. Akiyanova, only at the neotectonic stage, as a result of bending, did the Neogene sediment thickness accumulate up to 120 m, and the total amplitude of the latest deformations of the Irtysh depression averages -100, - 140 m, decreasing in the instrument parts to + 20 m. [one].

The question of the origin of shadows is interesting, since these lakes have morphology and morphometry not typical of flat lakes. The tectonic genesis of tenises was first expressed by V.V. Goian [2], who uses drilling data in his research. L.S. Berg [3], the origin of the basins of the shadows associated with various exogenous processes. Ya.S. Edelstein [4], A.S. Kes [5], K. N. Pestovsky [6], E.N. Posokhov [7], I.A. Volkov [8] and others, explained the origin of the basins by the remains of the Oligocene Sea, the result of leaching of salts, followed by compaction of rocks and deflation, inter-delta depressions, sor-deflation troughs, etc.

Conclusions V.V. Goian was supported by research conducted on the basis of the "Groundwater Cadastre of the USSR ..." [9], containing information from prospecting wells for water, as well as deep reference wells, many of which covered the entire thickness of sedimentary bedding of the platform cover up to crystalline basement rocks that made it possible to reconstruct the buried relief of different ages [10,11]. For the purpose of tracking the stages of forming the topography of the territory, the most informative is the buried surface of the deposits of the Chegan Sea, the transgression of which liberated the southern plains of Western Siberia about 40 million years ago. The primary surface of Cheganian deposits, represented mainly by blue-green clays of high thickness, is a marking horizon that can be clearly seen in the sections of the platform cover exposed by the wells. Another marking horizon is the surface of crystalline basement rocks. The deformations of the marking horizons indicate the nature and amplitudes of the displacement of the blocks lying at the base of the border zone of the aforementioned interacting structures of the described territory.

To identify the dependence of the modern surface structure on a similar surface structure of buried surfaces formed by marking horizons, the spatial and vertical positions of the most significant elements of the modern and buried topography are compared.

To analyze the buried topography of the described area, we used a scheme constructed in isohyets along the roof of the Oligocene Chegan and Paleozoic deposits [10].

Stratoisohypses, drawn through 20 m, show the current position of the roof of Chegan deposits and crystalline basement rocks. So, in the southern part of the region there are no Chegan deposits, and rocks of the Mesozoic and Paleozoic, which often go directly to the day surface (Paleozoic), lie close to the surface. The bedrock of the Kazakh shield, represented by granites, granodiorites, porphyries, quartzite's, extends into the described region in the form of a solid massif from the southwest. The surface of crystalline Paleozoic rocks drops very steeply to the north, northeast, and east of the ledge, i.e. towards the lakes. Wells located on the southern and northern shores of Lake. Kishi - Karaoy with a depth of 350 and 420 m did not reach the foundation. The fall of the surface of the Paleozoic rocks is more than 15 m / km.

From the aforementioned protrusion of the Paleozoic rocks to the north-west, north, northeast and east, the roof marks of the marine Oligocene decrease. The Paleozoic ledge is bordered by a wide strip with a relatively small drop lying at heights of 90-120 m. This strip occupies the space between the ledge of crystalline rocks and the hollows of the lakes. The width of the strip is variable: it varies from 12 to 40 km. Its relatively shallow surface turns into a steep slope, shown in the diagram by thickening of stratoisohypses. Above the hollows are the basins of the modern lakes of Kishi - Karoy and Kalibek.

The base of the slope in the northern and eastern side of the region is located at around 30-40 m in absolute height, turning into a more or less horizontal platform, above which there is a vast hollow of lake. Seletenitenis. Stratoisohypses of the overlying slope, enveloping the basin from the west, also form a hollow here.

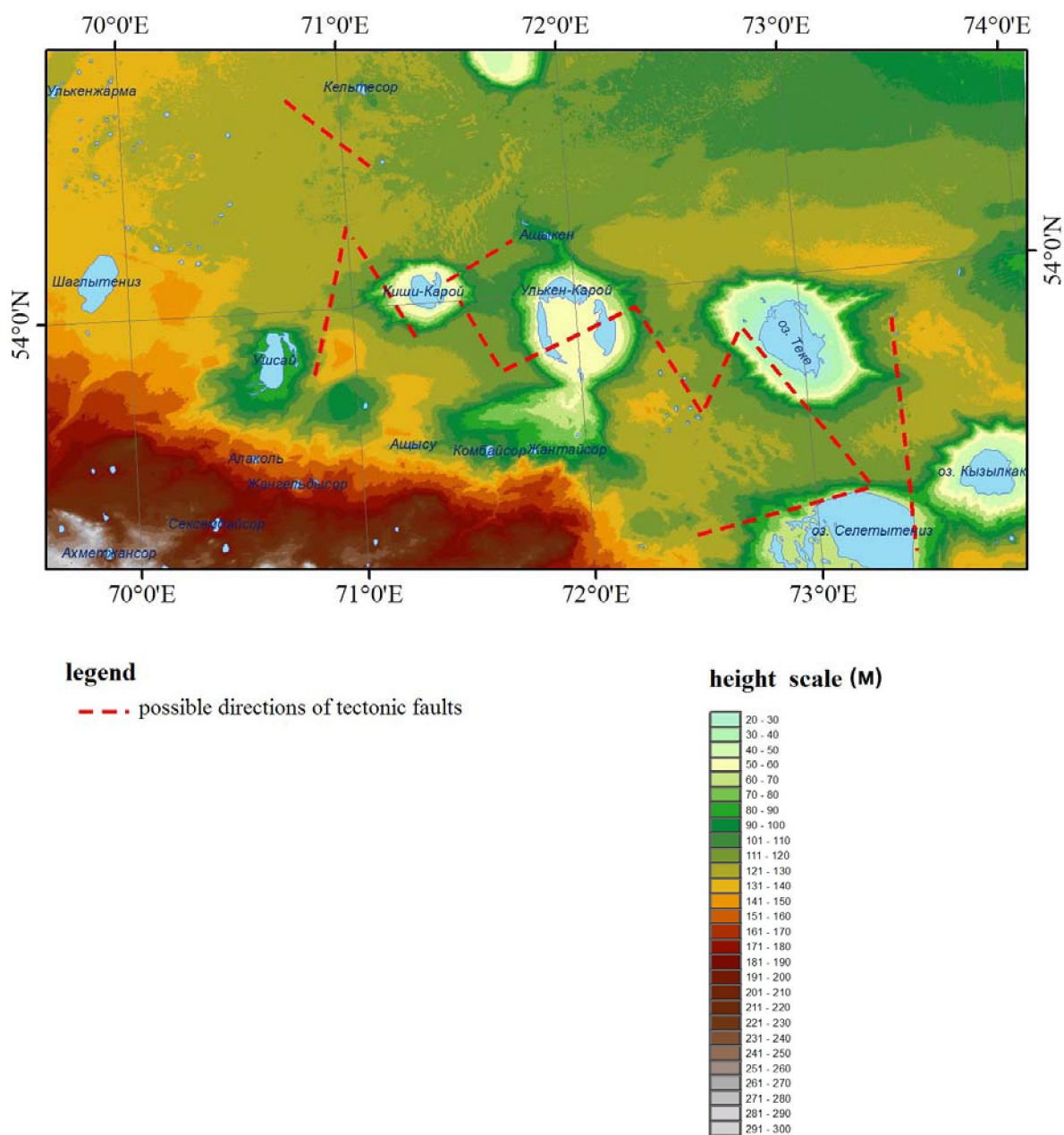


Figure 1 - Schematic relief of the buried surface along the roof of Oligocene marine (Chegan) sediments in the area of the shadows of Northern Kazakhstan

1 - roof marks, 2 - strato-gypsum, 3.- lakes, 4 - Paleozoic rocks,
5 - Mesozoic deposits, 6 - possible directions of tectonic faults

In the western part of the region above the slope in the range of heights of 85-110 m lies the basin of Lake. Shaglyteniz, which is incised shallow and is apparently located in the tectonic trough. Looking ahead, we note that disjunctive processes did not take part in its formation, as in the formation of deep basins of shadows. Probably, in the formation of the basins of the Alabota and Kalibek lakes, the influence of discontinuous processes was not significant, if at all, as can be judged by the distribution of elevations.

The relatively horizontal platform at the base of the slope is complicated by large depressions deepened to zero (possibly lower), to which the basins of modern lakes Ulkenkara and Teke are confined. The latter are somewhat shifted relative to the deepest parts of the depressions. Between the indicated

basins there is a peculiar double overhang on the roof of the Chegan deposits, oriented north-north-east, from which the bottoms of the basins are inclined respectively in opposite directions of the Basin of the lakes, on the contrary, are close to it. Perhaps this ledge is a continuation of the Paleozoic structure depicted in our diagram by an array of crystalline rocks.

Of particular interest in this geological situation is the following circumstance. The map diagram (see Figure 2) shows that north of the basins of Ulkenkaroy and Kishikaroy, the surface of the Chegan clay does not sink to the north and northeast, as one would expect, but somewhat rises. So, the well in the village. Kievsky (the northern shore of Lake Kishikara) opens it at an absolute height of 64 m. The position of the roof of the Chegan deposits right under the lake. Kishikara, according to the profile attached in the work of V.V. Goian [8], corresponds to the level of 40 m abs. heights, as in our diagram. Consequently, Lake. Kishikara is located in a narrow hollow, the bottom of which lies at the level of about 40 m, stretching to a deeply lowered block (Bulaevsky) in the territory of the Peter and Paul Priishimye [10,11]. The minimum elevations within the latter reach -11 m at s. Pisarevka, and the wells located 25-30 km to the east open the roof of the Chegan deposits already at elevations of 53, 54, 74 m, i.e. in this case, as well as north of Lake. Kishikara, there is no normal drop in the roof of the marine Oligocene. The same is seen in the section north of lake. Ulkenkara: three wells located at a distance of 3 km from each other, near the village. Novoselovsky (20 km north of Lake Ulkenkara) If we take the age of the shales as Paleozoic or Mesozoic (clay shales are discovered by some wells among the Cretaceous deposits of this region), then we must assume that there is a graben-like depression below Lake Ulkenkara. The displacement amplitude is at least 100-120 m.

Figure 1 shows the approximately drawn fault lines at the sites of greatest thickening of strato-gypsum.

Thus, the area of development of tenises is characterized by an undeniably complex tectonic structure, as evidenced by the deformation of the roof of marine oligocene sediments, taken as a marking horizon. Deformations occurred as a result of post-Chechen block tectonic movements. Large and deep basins of tenises are confined to negative tectonic structures (depressions, hollows) or are located above their slopes.

Lakes Kishi-karoy, Ulken-karoy and Teke are located in a common graben-shaped depression, which has an irregular shape in plan and profile. Viewing large-scale maps shows that east of Lake. Kishi-karoy towards lake. Ulkenkar stretches a wide depression with absolute elevations of 91 - 107 m, while the height of the interfluvial surface varies between 120 - 127 m. In addition, a hollow, but less pronounced than in the previous case, can be traced between the lakes of Ulkenkar and Teke. The presence of these depressions, apparently, reflects the above features of the deep structure.

Findings. 1) The material presented indicates that the system of basins of the shadows of the flat territory of the north-eastern outskirts of the Republic of Kazakhstan has a tectonic nature.

2) The system of basins of the Kazakhstani shadows is located in the border zone between the Omsk Depression of the West Siberian Plain and the slopes of the Kazakh Shallow Ridge, experiencing opposite tectonic movements for a long time: the Omsk Basin has lowered, the Shallow Ridge is characterized by a predominance of uplifts.

3) Due to the multidirectionality of tectonic movements, the boundary zone turned into a crushing zone: since the crystalline rocks of the basement undergoing tensile stresses turned out to be dissected by deep faults into individual blocks moving in the vertical and horizontal directions.

4) Preservation of the features of the deep structure up to the present state speaks of the inherited development of tectonic structures over a long time, including at the neotectonic stage.

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ПРОИСХОЖДЕНИЕ КОТЛОВИН ОЗЕРНЫХ СИСТЕМ ТЕНИЗОВ РАВНИННОЙ ТЕРРИТОРИИ СЕВЕРНО – ВОСТОЧНОГО КАЗАХСТАНА

Аннотация. Рассматриваются вопросы происхождения системы своеобразных озерных котловин Северного Казахстана, получивших название тенизов - степных морей, благодаря огромным площадям. При глубокой врезанности котловин тенизов, так что отметки уровня воды в них находятся ниже уреза в русле Иртыша на тех же широтах, глубины озерной сильно засоленной водной толщи незначительны. Сделан обзор представлений многих авторов о генезисе тенизов: Л.С.Берга, Я.С.Эдельштейна, А.С. Кесь, К.Н. Пестовского, Е.Н. Посохова, И.А. Волкова, связывавших их происхождение с различными экзогенными процессами: остаток олигоценного моря или огромного древнего потока, результат выщелачивания солей с последующим уплотнением пород и дефляции, междельтовыми понижениями, сорово-дефляционными впадинами и др. В.В.Гоян (1968) впервые пришел к выводу о том, что в формировании котловин тенизов главными факторами являются тектонические процессы. Реконструкция погребенного рельефа по данным бурения подтвердила выводы В.В. Гояна. Кристаллический фундамент территории развития тенизов раздроблен на отдельные блоки, сместившиеся относительно друг друга, а котловины тенизов приурочены к тектоническим впадинам.

Ключевые слова: тенизы – степные моря, тектонические впадины, озера, котловины, происхождение

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СОЛТҮСТІК ҚАЗАҚСТАН ТЕҢІЗДЕРІНІҢ КӨЛ ЖҮЙЕЛЕРІ ҚАЗАНШҰҢҚЫРЛАРЫНЫҢ ПАЙДА БОЛУЫ

Аннотация. Мақалада Солтүстік Қазақстанның ерекше көлдер бассейндері, тенис - дала теңіздері деп аталатын, кең аумақтарға байланысты пайда болуы туралы айтылады. Көленкелер бассейнін терең кесіп, ондағы су деңгейінің белгілері сол ендіктерде Ертіс каналының жиегінен төмен болуы үшін, өте тұзды лакустралық су бағанының тереңдігі мардымсыз. Мақалада көптеген авторлардың тенистердің генезисі туралы көзқарастары қарастырылған: Л.С. Берг, Я.С.Эделштейн, А.С. Кес, К.Н. Пестовский, Е.Н. Посохова, И.А. Олардың пайда болуын әр түрлі экзогендік процестермен байланыстырған: олигоцен теңізінің қалған бөлігі немесе ежелгі үлкен ағын, тұздардың сілтіленуінің нәтижесінде тау жыныстары мен дефляция, дельта аралық депрессиялар, сор-дефляциялық құдықтар және басқалар алғаш рет В.В. Гоян (1968). тектоникалық процестер көлеңкелер бассейндерінің қалыптасуының негізгі факторлары деген қорытындыға келді. Бұрғылау мәліметтері бойынша жерленген топографияны қайта құру В.В. Гоян. Тенизді игеруге арналған аумақтың кристалды жергелесі бір-біріне қатысты жылжып кеткен жеке блоктарға бөлінді, ал үстірт бассейндері тектоникалық депрессиямен шектелген.

Түйін сөздер: Тенизалар - дала теңіздері, тектоникалық ойпаттар, көлдер, бассейндер, шығу тегі.

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