ON THE GEOLOGICAL HISTORY OF THE FORMATION OF THE ANGREN DEPRESSION AND BURY COAL DEPOSIT

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Abstract. The article considers the epochs during which the modern features of the structure of the Angren depression and the kaolin-brown coal deposit of the Central Asian Lower Mesozoic coal province were formed. The history of the geological development of the region covers periods from the late Paleozoic to the Mesozoic-Cenozoic. Great changes in the geological history of development occurred in the Hercynian tectonic cycle. During the period of tectonic movements, as well as the post-volcanic activity of paleo-volcanoes, a large, isometric depression basin was formed in the region, the inherited development of which contributed to the formation of a powerful coal complex and created conditions for the conservation of the deposit. The maximum subsidence occurred in the middle part of the depression, where up to 20-25 m of total coal thickness was deposited.

Keywords. brown coal, kaolin, Mesozoic, lithological-petrological, Paleozoic, Caynazoic, anticlinal system, volcanic, Fanerozoic, Calder, sedimentation, peneplanation of the region, transgression.

The Angren brown coal deposit was discovered in 1932 by the geologist of the Central Asian District Geological Exploration Department, D.M. Bogdanovich, who, while searching for construction materials for the needs of the Almalykstroy, conducted borehole work at the Dzhigaristan outcrops of kaolin and in borehole No. 1, discovered two layers of soot coal, with thicknesses of 1.6 and 0.2 m. In the same year, Prof. N.V. Shabarov inspected the work site and came to the conclusion that, in addition to a large kaolin deposit, there was a very promising coal deposit here.

Analysis of existing literature data (1,2,3,4 et al.) on the geological and tectonic structure of the Chatkal-Kurama region showed that the pre-Mesozoic foundation of Angren, as in other regions of the Middle Tien Shan, has a number of features determined by the complex evolutionary processes of sedimentation, tectogenesis, and volcanic-plutonic activity.

The Angren Depression is a complex formation. In the upper reaches of the Akhangaran rivers, there is no depression, but there is the Kurama cliff, which slopes gently to the northwest, and the Chatkal cliff is pushed over it. The thin cover of tertiary deposits clearly expresses the clastic nature of the region's structure and the interrelationships of rigid tectonic blocks. In the southwestern direction, due to the faster subsidence of the Kurama cliff compared to the Chatkal cliff, parallel faults appear below the Yertash River, developing in the southwestern direction so much that a depression is formed in the Angren deposit area, limited by faults from the Chatkal and Kurama ranges. The deposits of the Quaternary system in the Angren Depression are very diverse in composition, genesis, and occurrence conditions. In addition to the usual molasse-type sediments for intermontane depressions, they include buried and modern landslides, collapsed masses, and specific rocks of many coal deposits called "burnt," i.e., formed as a result of the burning of coal seams.

Quaternary system molasses differ from neogene molasses by the predominance of alluvial and alluvial-proluvial deposits in their cross-section.

The Angren deposit is located in the transition zone of the high-mountain part of the depression with highly elevated and dissected deep canyons of the Quaternary deposits to the depression, where sediments in individual areas deposited in the usual sequence for the regions of accumulation, according to which they lie on neogene deposits and are involved in fold-forming movements.

In its modern structural plan, the deposit is confined to the Angren Depression - a complex formation in terms of tectonics.

The depression is a wide (6-7 km in the upper-eastern part of the valley, 13-14 km in the middle part of the valley, and 5-6 km near the city of Almalyk), kare-like graben-sinklinal, made up of a complex of Mesozoic and Cenozoic sedimentary formations with an almost flat, sloping bottom (to the west) along the course of the Akhangaran River. In the north and south, the depression is limited by tectonic disturbances, along which the Chatkal and Kurama mountains are superimposed.

Considering the rigidity of the pre-Mesozoic foundation, characteristic of the entire Chatkal-Kurama region, it is known that there are three plates in the region that form the main features of its complex structure, the first of which is associated with the Kurama gorst, the second with the actual Angren depression, and the third with the superimposed gorst. In the southwestern direction, the depression extends downstream along the Ohangaron River for 65-70 km to the city of Olmaliq, where it merges with the Tashkent Depression (Figure 1).

A crucial issue for deciphering the tectonic structure of the Angren Depression is determining the nature of the fault structures separating it from the Chatkal and Kurama horsts. Previous researchers have established that these ruptures are crevices, often complicated by transverse ruptures [2,3].

The Angren brown coal deposit belongs to the rare continental formations type, where a favorable combination of climatic and tectonic factors in the area of continuous development of volcanic deposits contributed to the simultaneous accumulation and preservation of large masses of plant matter and kaolin. As a single geological entity that has gone through a long and complex history of development.

The Angren brown coal deposit, considered in the literature as part of the Angren-Pritashkent coal region of the Central Asian Lower Mesozoic coal province, holds a special place among other coal deposits in the region. It is characterized by a specific structure and lithologopetrological composition up to the Mesozoic foundation, possesses a unique complex of Jurassic formations, and is distinguished by the repeated activation of Mesozoic and Cenozoic volcanic activity.

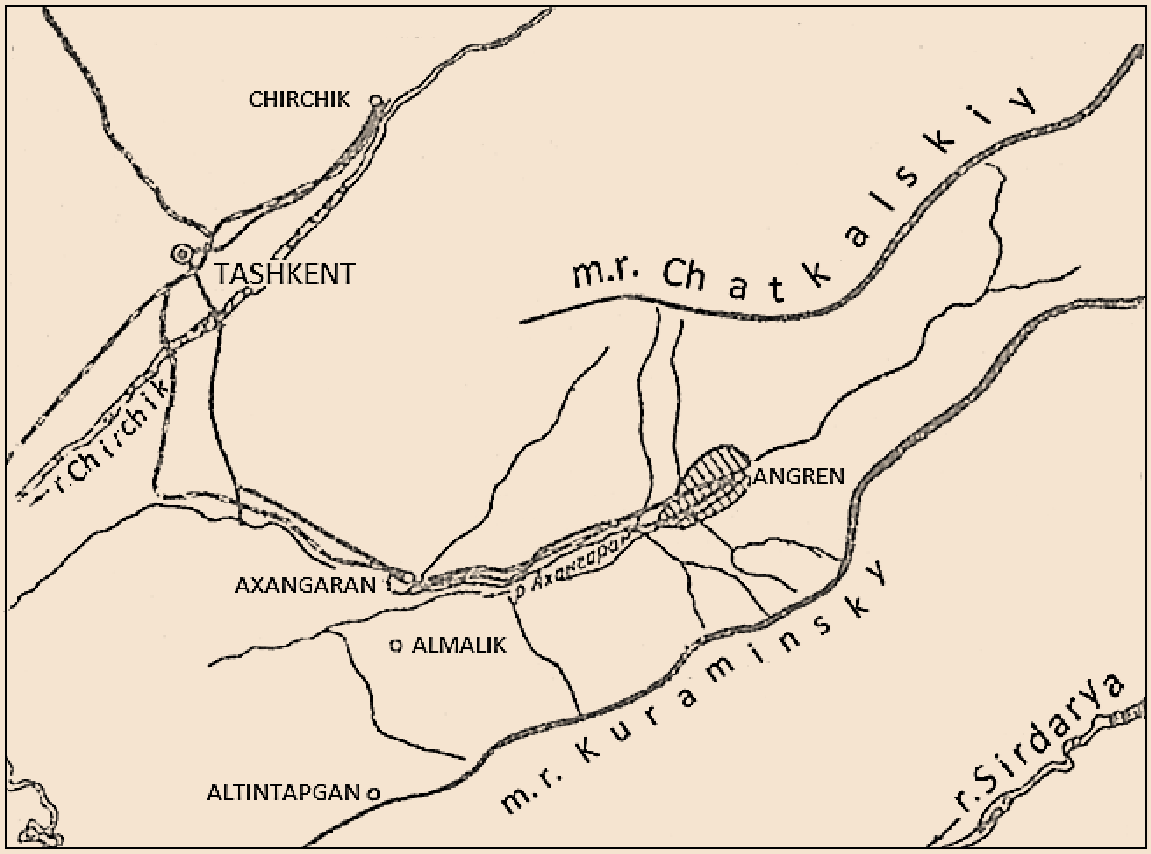


Fig. 1. Schematic map showing the location of the coal deposit area

The geosynclinal development in the region ended in the pre-Paleozoic, possibly in the Karelian cycle, and from the beginning of the Phanerozoic, the region developed as a geoanticlinal system, transforming in the orogenic stage of the hercynide into a dome-block folded structure, according to V.A. Arapov. M.A. Akhmedjanova. A.A. Bagdanova. O.M. Borisova. E.D. Karpova and other geologists, close to the middle massifs [2].

In the late Paleozoic, the pre-Mesozoic foundation represented a single, extremely rigid formation, complicated by mosaically arranged volcanic-tektonic structures. The latter, it seems to us, played a significant role in creating conditions conducive to Jurassic sedimentation in general and to the accumulation of carbon, in particular.

In the Carboniferous period, near the deposit, on the adjacent Angren plates, large volcanoes such as Kaminskiy, Lashkerek, Babay-Taudorskiy, and others were active, determining the main features of the morphology of the mountainous region with large relief.

At the same time, volcanic formations were being filled, and the Shavaz-Dukent, Almalyk, Altyntopkan, and other grabens located near Angren. As magmatic foci developed, individual volcanoes ceased to exist and new ones emerged. In the Upper Carboniferous period, the listed volcanoes in the Angren region extinguished, and soon, large sedimentary molds formed in the place of Kamchinsky and Lashkersky, and in the place of Babay-Taudorsky, a resurgent caldera. In the early Permian, all these depressions turned out to be either liparite or trachyliparite formations of considerable thickness. By the end of the Permian period, the scale of volcanic activity seems to have decreased, and intensive destruction of mountains and peneplanation of the area began.

By the beginning of the Triassic, the relief in the area was denudated. An erosional surface formed, which in the lower-middle triassic period served as a basis for the deposition of the volcanic cover.

In the Upper Triassic, when the Chatkal-Kurama region, according to L.A. Rukhina's calculations, established an arid climate regime in the region for a long time, with very slow erosion, which contributed to the formation of a kaolin weathering crust with a thickness of up to I50-130 m. The slope of the surface in the Upper Triassic occurred in the southern direction, towards the epicontinental seas of Tetis.

Early Cimmerian tectonic movements, which occurred at the turn of the Late Triassic and Early Jurassic periods, led to the appearance of notable uplifts north of the deposit, which, along with climate humidification, resulted in the emergence of a river network. In the Early Jurassic period, in the eastern part of the deposit, apparently along a weakened zone, a meridional channel of a paleo-river (Paleo-Apartac, according to V.A. Zakharevich) was formed, which is now preserved for 9 km between the Chatkal and Kurama horsts (Figure 1). West of this river, two more channels (middle and western) developed, which, like the Paleo-Apartac, were directed southward and were most likely the upper reaches of its tributaries. The channels of these paleo-rivers had a width of 200 to 500 m and were filled with alluvial deposits (channel, floodplain, swamp-floodplain), with a thickness of up to 40-50 m. The watershed areas and upper terraces of the paleo-valleys represented wide (up to 4 km) flattened areas, dissected by dry valleys, with exposed weathering crust. V.A. Zaxarevich believes that in the first pores, due to the humid climate and drainage of the upper part of the weathering crust, its "maturation" occurred, forming the second and third zones shown above [6]. Simultaneously, on the slopes, re-deposited material from the weathering crust accumulated in the form of pattums (mixed sandy-alveolar-clay rocks), sandstones with gravel, light gray or white on kaolin cement, usually heavily pyritized, in places with layers of pure plastic kaolin clays, which N.P. Petrov attributes to primary kaolins formed from daes of quartz-free porphyrites [7]. As the slopes filled, precipitation began to accumulate on the upper terraces of the Paleovalleys and their watersheds. In the final stage, the flowing waters on most of the remaining weathering crust outcrops sorted the primary kaolins and enriched them with plant material in individual areas. Later, after the beginning of the formation of the Mohyn complex, the upper 2-5 m of the exposed section of the weathering crust, due to the influence of bog waters and the diagenesis gases released by peat bogs, transformed into unique, dry clays, considered as a facies of bog soils developed on the basis of primary kaolins [1,6,7].

Tectonic movements that occurred at the boundary between the Early Jurassic and Aalenian led to the formation of a large, isometric depression in Angren. The inherited development of this depression contributed to the formation of a substantial coal complex and created conditions for the preservation of the deposit.

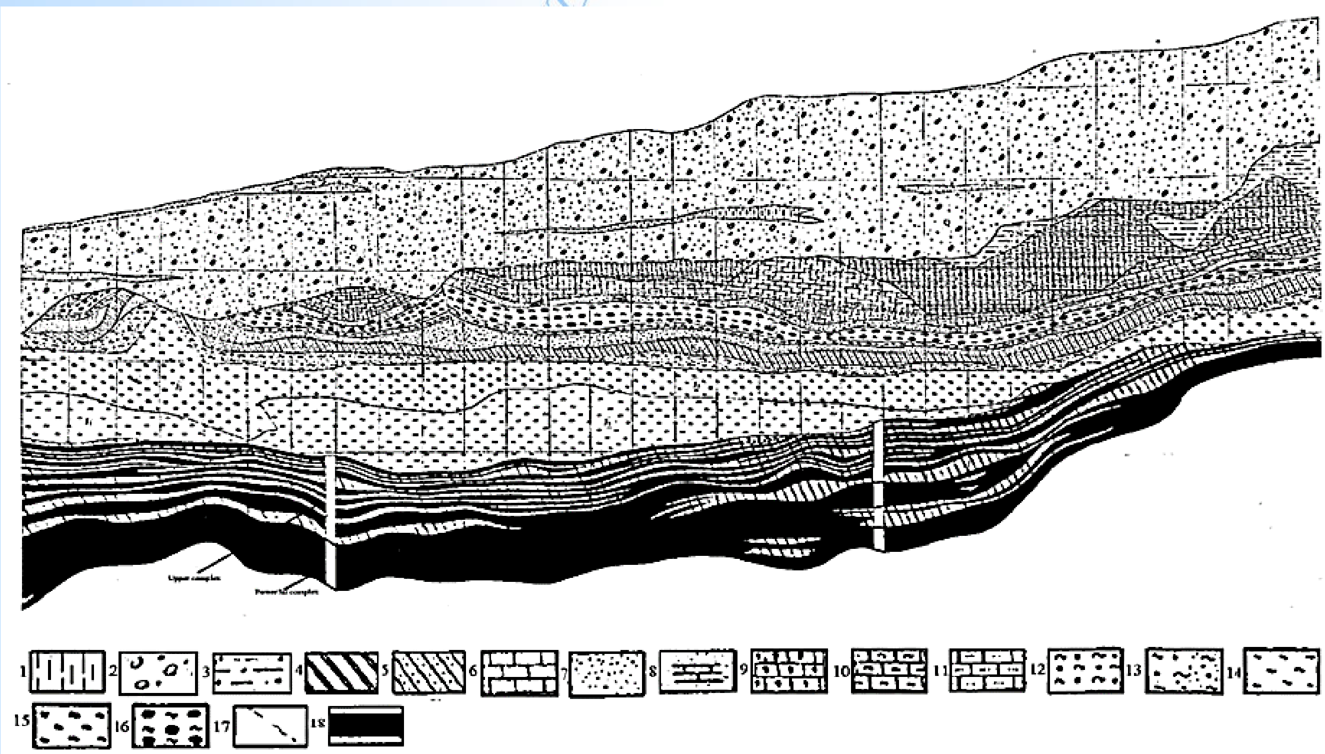
The appearance of a compensatory trough in Angren at the beginning of the Middle Jurassic is primarily evidenced by V.A. Zakharevich's discovery of the newly formed depression intercepting the previously "through-flowing" course of palaeorivers. As a result of this interception, the northern part of the Palaeoapartak River maintained its southward flow, while its southern part, called Palaeo-Jigiristan for the Aalenian-Late Jurassic period, began to flow in the opposite direction, i.e., northward. Several small river systems were formed, three of which were directed from the north to the south (Paleoapartak, its tributaries, Paleoablyk) and, indeed, two (Paleojigiristan, Paleochuchkabulak) had a reverse course, from the south to the north: there were also river systems flowing into the depression from the northwest and east. [1,6,8,9,10].

The new distribution of water flows was a crucial condition for excessive moisture in the interior of the depression and led to its intensive waterlogging and peat accumulation. The subsequent consedimentation of the resulting structure led to the localization of Jurassic deposits within the depression and the most intensive subsidence of its central parts. As a result of such subsidence, in particular, the deposits of the Upper Complex were localized within the contour of the underlying thickness of the Aalenbaian rocks (Mighty Complex), as if suspended at the edges of the mold, and all the deposits together were eroded by transgressively adjacent deposits of the Upper Jurassic. The development area of the latter, although it occupied a somewhat larger area (75 sq. km) than the area (spread area) of the underlying coal deposits, also did not extend beyond the boundaries of the mulda.

Taking into account the widespread development of volcanic-tektonic structures and the peculiarities inherited in the Jurassic period of the pre-Mesozoic foundation, we believe that the formation of the Angren compensation molds occurred due to the settlement of the roof of the ancient late Paleozoic chamber of extinct volcanoes, which remained unfilled with molten material until the Jurassic period. In other words, the Angren mound can be considered nothing but a sedimentary calder, which introduces new content to the assessment of the genetic appearance of the Angren deposit and its place among other coal deposits.

The subsidence of the roof of the former volcanic chamber and the formation of the caldera floor was consedimentary, and due to the different rates of subsidence in different parts of the structure, it was accompanied by the formation of gentle passive submeridial (SSZ-YuYuV) anticlinal and synclinal folds, up to 4 km wide, with a maximum wing angle of 4-5°. The most smooth and calm subsidence occurred along the periphery of the structure, near the rupture wall, along which, excluding the paleoregional channels at the beginning of the Aalenian, intensive waterlogging began.[6] Initially, predominantly homogeneous plant communities (shrubs, ferns, ginkgo and coniferous) developed, whose development was occasionally interrupted by short-term sediments of silt or sand. As a result, by the end of the bayos, a compact coal deposit with a total thickness of 20-25 m formed along the periphery of the caldera, consisting of a relatively uniform fibrous-earth coal with 2-5 thin layers of clays and sandstones. The formation of the deposit was accompanied by breaks in the development of peat bogs associated with either a decrease in the groundwater level (layers of highly swelling earthen coal) or its brief flooding (thin layers of sandy-clayey rocks or the washing of large-fragment vegetation, which led to the formation of layered multicolored coals). With prolonged waterlogging of peat bogs and high groundwater levels, vegetation changes occurred, and the helization processes intensified, leading to the formation of coals with a displaced petrographic composition. (Fig.2).

Fig. 2. Geological section of the Angren brown coal deposit



1. Loess-like loams; 2. Cemented gravel; 3. Conglomerates on carbonate-clay cement; 4. Interlayering of aleurolites and clays between coal deposits; 5. Aleurolites are greenish-red; 6. Limestones; 7. Loose sandstones; 8. Limestone sandstones; 9. Limestones with fauna;10. Mergels are greenish-yellow; 11. Limestones for sandy; 12. Powdery clays for sandy clays; 13. Sandstones with layers of fine-grained conglomerates; 14. Gray kaolin clays; 15. Multicolored kaolin clays;16. Poppies are greenish-yellow; 17. Rupture disorders;18. Brown coal.

The area of continuous swamping along the periphery of the caldera in the Aaleniabayos was interrupted by the channels of the aforementioned small river systems.

Due to fluctuations in their life force and channel migration, depletion zones formed in the central part of the deposit, with various transitions from compact deposits to "depletion." Often, these transitions occur gradually, due to an increase in the number of rock layers and their thickness in the direction from the calder edges to the paleoresults. However, erosion occurs very often when rather large coal seams are interrupted by channel sandstones. (Fig.2).

The Paleoapartak River remained the largest river in the Aalenian-Bayas. It entered the deposit area in the northwestern part of the Apartak and flowed in a southeastern direction, ending at the Carbonaceous area. As V. A. Zaxarevich shows, the activity of this river was far from constant: by the number of large lenses of alluvial sandstones in the wooden complex, 5-6 stages of the intensification of its vital force are noted. Periods of high activity alternated with a sharp weakening of river activity, when the riverbed was temporarily covered with peat bogs, the river retreated upstream, depositing sandy-clayey sediments in the northern part of the Apartak, where during the formation of the Angren suite, a 100-120-meter thickness of delta-river sediments was formed, of which the lower 40-50 m basal layers correspond to the thickest and 20-30 m upper complex. In the Apartak delta zone, several thin lenses are preserved from the 40-meter coal deposit of the powerful complex, the thickness of the coal layers increases in the South, then their convergence occurs, and at I km from the modern southern tectonic boundary of the deposit, the sandy-gravel zone of the delta is replaced by a swampy-delta zone, where coal layers interspersed with alluvium and even predominate over it. All rock layers carry traces of active water activity - a large amount of calcined plant silt, often randomly oriented. Inclined layering, weakly expressed material sorting, and linear orientation in the plan of sediments clearly indicate their proluvial-alluvial genesis. Clays and sandstones with root systems, pyritization of vegetation material, and carbonaceous clay aggregates are characteristic features of swamps formed in the floodplains of the Paleorek. To the northwest of the Carbonaceous section, the Paleo-Apartak floodplain was divided into numerous branches, where the depletion zone was divided by B.A. Zakharevich into high and low carbon saturation subzones [6].

Non-permanent watercourses in the alaenebaios existed in the northwestern part of the deposit (Ablyk and Dukentsai settlement area). The Paleoablyk valley was likely similar to the Paleoapartak valley. Interestingly, a layer of fine-grained conglomerate, completely uncharacteristic of the Angren Jurassic deposits, with well-rounded cartilaginous-crested gravel, was discovered by wells at the Ablyk site in the Moshchny complex section. Obviously, this paleo-river provided material for long-distance transport from areas with large relief. River flows descended into the caldera and from the east. [6].

Small, periodically waterlogged alluvial fans, composed of lenses of variegated sandstones and clays, are found in the upper part of the Mohyn complex in the eastern part of the Carbonaceous Formation. (Fig.2).

The transgression of the Tetis epicontinental seas, which began in the Baths, also affected the sedimentation conditions in Angren. The climate became more humid, which led to an increase in the activity of flowing waters and the cessation of the previously stable regime of dry peat bogs with low groundwater levels. The predominant pure coals in the aalenbaios in the western century are replaced by clay coals of the same type, and lowland peat coals appear. Frequent floods caused the periodic establishment of an alluvial plain regime in the depression, varyingly compensated by river runoff (This situation developed, in particular, in the middle part of the Great Muld, where 5-6 layers of coal of complex structure intermingle with sandy-clayey deposits on an area of about 20 sq. km).

At the boundaries of the inner and outer (peat) zones of the deltas, epigenetic erosion of peat bogs, when the lenses of river sands completely replace coal layers, was not uncommon. Flood-like, oblique stratification and the cleavage of coals by sandstones became characteristic.

The formation of Upper Complex deposits was accompanied by further subsidence of the caldera bottom and associated development of passive folded structures within its boundaries. The sedimentation area in the western century, as we have already noted, turned out to be smaller than the area in the formation of the Strong Complex, as a result of which the Upper Complex was localized within the contour of the latter. The maximum bending occurred in the middle part of the Great Mulda, where up to 20-24 m of the total coal thickness was deposited [6].

Further north, near the Apartak section, for approximately 0.5 km, marshy facies were replaced by silty-sandy deposits of the Paleo-Apartak River delta, which grew stronger under new conditions. A close picture existed further south, near the Paleogiristan alluvial fan, where the section's carbon saturation decreased from 20-24 m to 0-5 m, and its total thickness was 60 m. Subsequently, as established in the modern Naugarzan section, the Upper complex merged with the Strong to form a single series of lake-delta precipitation. The coal-bearing deposits of Bata, bypassing the Paleojigiristan alluvial fan, spread to part of the field of mine No. 9, after which they soon eroded and were replaced by sandy-clayey deposits. In the Nishbash and Chushkabulak areas, sandstones of varying grain sizes (up to gravel incl.) with layers of siltstones, rarely clays, and very rarely coals, have developed. The total thickness of the deposits here was 150-190 m. It is quite characteristic that towards the side parts of the caldera, the total thickness of the Upper complex, due to the proportional reduction of thickness and rock and coal layers, decreases by 2-3 times, emphasizing the consedimentary development of the structure in the Bath century.

As in other regions of Central Asia, the beginning of the late Jurassic period in Angren was marked by new tectonic movements. These movements were accompanied by hereditary heterogeneous sedimentation of the caldera floor and the discordant laying of Upper Jurassic deposits on older formations. The consedimentation subsidence of the molds is reflected in the expansion of the area of Jigiristan suite sediment accumulation, the outer contour of which, determined by the line of occurrence of Cretaceous deposits on the weathering crust, was 200-500 m further than the contour cut by Upper Jurassic deposits of the Angren suite section. (Fig.2).

However, no major reconstructions occurred during this time, and in the late Jurassic period, as V.A. Zaxarevich established, a comprehensive flow continued into the Angren sedimentary mound: from the slopes, through a small ravine network, but mainly - along small river systems established in the Middle Jurassic.

Near the fault walls, these rivers formed alluvial fans, composed mainly of loose, often re-deposited, often gravel-covered sandstones with a small number of clay layers. In plan, these cones have the shape of a delta. In the late Jurassic period, in particular, the Paleojigiristan River shifted westward and formed a alluvial fan with a width of more than 2 km; sediment erosion intensified along the eastern tributaries of the river, forming a continuous series of gravel-sand deposits along the north-eastern boundary of the deposit, alluvial fans became clearly visible in the Zagasan and Nishbash sections, the alluvial fan of the Paleochuchkabulak River shifted southward; therefore, clay-alveolar deposits with a significant number of concretionary brown ironstones, corresponding to the outer part of the river delta, developed here.

Along the periphery of the alluvial fans, sand-gravel deposits formed a drift, in the composition of which sandstones played a dominant role, but already with the significant participation of clays and siltstones. In the inner part of the depression, the sand drift transitioned into an alluvial plain, the sediments of which were mainly composed of clay and silt rocks, only in some places containing lenses of gravel sandstones. The sedimentation of these deposits was accompanied by rhythmic fluctuations in the intensity of the disintegration of fragmented material, due to which the movement of sandy zones, sometimes advancing into the plain, sometimes shrinking in size, occurred repeatedly over time. In the inner part of the depression, the lake facies has developed predominantly, due to which clay-silty rocks began to dominate over allovial-prolovial and. The relief in the depression, both in the internal expanse and in the alluvial fans, where lake-developed facies (brown ironstones) developed among gravel sandstones, was flattened, compensated by close transportation of material from exposed areas of primary kaolins around the caldera. Due to a thorough study of the latter's substrate, it is possible to explain the peculiarities of the geochemical and mineralogical composition of secondary kaolins, characterized, in particular, by the insignificant content of calcium and alkalis.

The onset of the Cretaceous period in Angren was marked by the manifestation of the Novo-Kimmerian (Andian) phase of folding, which was expressed in the uplift of the territory by a large stratigraphic break, encompassing, in addition to the upper Jurassic, its entire lower and, apparently, part of its upper epochs. There are all grounds to believe that the pre-Mel deposits underwent deep denudation at this time, but the area: the development of Jgiriosgan suite formations to the early Mesozoic, according to data from most wells in the Angren depression, has established transgressive overlying of upper Mesozoic rocks on the weathering crust [1,6]

In the Upper Cretaceous period, the settlement of the Jurassic caldera of Angren ended. During this time, partial structural restructuring occurred in the region, resulting in small uplifts in place of the present-day Chatkal and Kurama ranges, and a weakly expressed depression formed between them, into which the sea soon entered from the Fergana and Tashkent region. A lagoon-sea regime was established, the carbonate sedimentation of which was complicated by the terrigenous deposits of numerous underwater river deltas, which, along with close erosion, ensured the long-distance transport of sand and gravel material from the uplifts located northeast and southwest of Angren. [9,10].

The geochemical conditions in the lagoon were also interesting. Judging by the insignificant manifestations of phosphorus and glauconite, the lagoon-sea regime in the Upper Cretaceous period was accompanied by underwater fumarol activity (phosphorus) and ash deposits (glauconite), indicating the continuation of the existence and activity of deep volcanic foci in the late Mesozoic. During the Upper Cretaceous period, V.L. Zaxarevich noted the shallowing of the lagoon, which led to the oxidation of the iron oxide forms contained in the sediments and the coloring of the deposits in intense red hues. In the final stages of the Cretaceous period, some waterlogging occurred in the region. This was reflected in the accumulation and peripheral parts of the lagoon of facies of above-ground deltas (gravel conglomerates), and in its central part - facies of temporarily forming lakes (limestone sandstones).

The beginning of the Cenozoic era was marked in Angren by new tectonic movements and the Loramian phase of folding, expressed in a stratigraphic break and the absence of Paleocene deposits. Another transgression of the Tethys seas, which occurred at the beginning of the Lower Eocene, led to the establishment of a lagoon regime in Angren. North and northwest of the deposit, at this time, there was a peneplained land, from which the underwater delta of a seemingly large Paleora River descended into the lagoon. By the predominance in delta sediments (sandstones, conglomerates) of perfectly rounded quartz and siliceous gravel, characteristic of the metamorphic rocks of the Kyrgyz ridge and the Cossack steppe. This river possessed significant life force and provided long-distance transport of clastic material [1,6,7]. Along the periphery of the Paleo-Delta, in the central part of the lagoon, quartz sands predominantly deposited, and in some places, montmorillonite clays were significantly involved. The latter circumstance, as well as the widespread development in the upper reaches of the opok horizon, emphasizes the continuation of the noted upper Cretaceous peplopades and fumarol activity even in the lower Eocene. To the south, the area of sandstone development is sometimes replaced by areas of sandy-gravel deposits, indicating the manifestation of runoff from the chain of islands that existed at this time in the area of the present-day Kurama Mountains.

At the beginning of the Middle Eocene, due to the intensification of Tetis's transgression, the lagoon regime in Angren was replaced by a maritime one. The sea flooded the island chain south of the deposit and, coming close to the Chatkal land, began to erode its shores, forming a trail of brekchium from honest igneous rocks [6]. Primarily terrigenous sedimentation in the basin was replaced by carbonate sedimentation, but along the coast, mixed, carbonate-terrigenous sedimentation occurred. Judging by the lenses of granular phosphorites in the limestones in the region and in the Middle Eocene, fumarol activity has not ceased.

The marine regime existed in the Upper Eocene, but at the top of this tier, due to a new tectonic restructuring (Pyrenean phase), marine regression occurs, and by the end of the Oligocene, a continental regime is established in the region.

From this moment, the formation of a modern tectonic structure begins in the region. Intensive uplift of the Chatkal structure and relatively slowed up of the Kuraminsky occurred with the formation of the Angren Depression itself. According to B.A. Zaxarevich, during the formation of the oligocene-lower neogene continental molasse, the latter's width was at least 2 times greater than the modern one. [6].

At the end of the Lower Neogene, new tectonic movements (Attic phase) occur, leading to the unilateral movement of the Kurama and Angren plates, the formation of the valley's modern structure, and the complex of developed Upper Neogene and Quaternary deposits within its boundaries. A very important feature of the Quaternary history of Angren is the discovery of pyromagma foci during the advance of the Kurama Plate, which led to the formation of burnt rocks.

The Quaternary system is represented by all four sections. The deposits of the Sukh cycle are not always separable from the Upper Neogene, the remaining cycles are determined more or less accurately. The deposits of the Syrdarya and Golodostye cycles are determined by undeformed alluvial terraces, while the Tashkent cycle is determined by the presence of thick loess-like rocks in the upper terraces of the valley.

The thickness of alluvial and alluvial-proluvial, predominantly pebble deposits of the Syrdarya and Golodnostep cycles fluctuates within 15-20 m. The total thickness of the Quaternary deposits in the Angren region reaches 170 m.

Landslide phenomena play a noticeable role in the structure of the deposit. The formed landslides participate in the rocks of all young deposits, from the Jurassic to the Quaternary. Favorable conditions for their development have developed along the entire left bank of the Angren deposit, where low-lying Jurassic and Cretaceous-Paleogene deposits are cut off by the Ohangaron River. The plasticity of water-resistant rocks with loose water-bearing sediments is the cause of landslides.

Successful development of the deposit will require solving complex problems when the quarry approaches the zone of young folds and faults, where the rock masses are in a stressed state. Excavation of this zone with a depth of up to 260 will be accompanied by complex mining and geological processes. Therefore, to clarify these issues, it will require much more work from geologists, technologists, and designers.

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