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Main Features Of The Geodynamic Evolution Of Domesozoic Formations And Metallogenic Zoning Of Endogenous Gold Mineralization Of The Tien-Shan Orogenic Vein System

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ABSTRACT

Geochemical testing covered the entire territory of Uzbekistan, but with varying degrees of detail. Most, 85-88% of the republic's area is covered with Mesozoic and Cenozoic sediments, with which exogenous deposits are associated. Pre-Mesozoic formations - the environment of localization of endogenous deposits, confined to the mountain systems of the Median and South Tien Shan. Mountain heights with outcrops of Pre-Mesozoic rocks occupy about 12-15% in area, the rest is in semi-closed and closed territories. Primary halos are recorded on the surface and at depth, secondary ones on the surface, as well as near it: below the raft - in water, above - in the surface atmosphere. Improving forecasting efficiency in regional geochemical works, interpretation and assessment of different-rank ore-generating geochemical anomalies in complex landscape-geological conditions.

KEYWORDS

Evolution, geochemistry, zoning, metallogenic province, metallogenic region, pre-mesozoic basement, mountainous and foothill regions, geochemical halos and anomalies, forecast, geochemical map, predictive metallogenic analysis of minerageny, ore content, minerals, promising positions.

INTRODUCTION

The existing models of the geodynamic development of pre-Mesozoic formations on the territory of Uzbekistan are based on the

concept of plate tectonics about the successive stages of development: continental rifting, formation and development of

paleoceanic structures, subduction, collision, formation of the newly formed crust, which generally correspond to the Wilson cycle. At the initial stages of research, general questions of the geodynamic development of the territory of Central Asia and its individual regions were developed (Sabdyushev, Usmanov R.R., 1971; Schulz-Jr., 1974; Burtman, 1976; and others). In 1987, research began on the Kyzylkum geodynamic polygon at a scale of 1: 200,000, later paleogeodynamic reconstructions were carried out and

In 1993-1997. A geodynamic map of the territory of Uzbekistan at a scale of 1:500 000 was compiled with the aim of conducting metallogenic analysis from the standpoint of the concept of tectonics of lithospheric plates and compiling a predictive metallogenic map for gold (Kazakbaeva S.M., Golovanov I.M., Horvat V.A., etc., 1997). Basic geological base - Geological map of the Republic of Uzbekistan at a scale of 1:500 000 (Mikhailov, Kozyrev et al., 1993). The main tectonic unit is a structural-material complex - which is a set of paragenetically related sedimentary, volcanogenic and intrusive formations that make up a certain tectonic structure formed in a specific geodynamic setting. The structural-material complex is formed by material series that allow restoring the geodynamic modes of interaction and development of lithospheric plates - intraplate continental development, expansion, convergence and collision. The time of manifestation of a certain geodynamic regime corresponds to the stage of geodynamic development, and qualitative changes in it correspond to its stages. According to E.R. Bazarbaeva, A.A. Zemlyanov, with the participation of the author for the Nurata region (Kazakbaeva S.M. et al., 1997), the following stages and stages of the geodynamic development of the lithosphere of Uzbekistan, which generally correspond to the cycles of Wilson's geodynamic evolution, taking into account modern data (Savchuk,

geodynamic regimes of the formation of pre-Mesozoic formations were identified throughout Uzbekistan because of attraction of new data on the stratigraphy, petrology, absolute age, geophysics, geochemistry, paleomagnetic measurements. and others (Ruzhentsev, Sokolov, 1983; Mukhin, Tolokonnikov, 1985; Mukhin et al., 1989, 1991; Maslennikova et al., 1989; Bukharin, Brezhnev, 1989; Abdullaev et al., 1989; Dalimov et al., 1993 ; Savchuk, Mukhin, 1990, 1991, 1993; Biske, 1996, etc.).

1999; Dalimov, Troitsky , 2005; Dalimov, Divaev, 2010; Dalimov, 2011; Ishbaev, 2007; Kustarnikova, Usmanov, 2008; Saydyganiev, 2009; Abduazimova, 1999; Abduazimova et al., 2011; Mirkamalov et al., 2011; Urunbaev, 2007; Urunbaev , Abubakirov, 2011, etc.).

MATERIALS AND METHODS

Stage I - the stage of intraplate development of the ancient continental crust, up to PR_3 . The features of the Proterozoic metamorphic and magmatic complexes of the Tien Shan territory suggest that by the end of the Proterozoic a continental type crust had formed, and ancient crystalline and metamorphic formations were destroyed and eroded.

Stage II - stretching of lithospheric plates (riftogenic) - PR_3 ? As a result of the ascent of the heated anomalous mantle under the ancient continental crust of the Kazakhstan paleocontinent, the fragile part of the crust is stretched and split. A rift structure is being formed, dividing the paleocontinent into two parts - the Kyrgyz-Kazakh and Karakum-Tajik microcontinent.

Stage III - spreading of lithospheric plates (divergent) R_{2-3} - O_1 .

A. The stage of the formation of the Turkestan paleoceanic space and the formation of passive continental margins PR_3 - R_{2-3} -V. Active

processes in the mantle lead to the expansion of the continental crust and the formation of a spreading zone, which is associated with sedimentary-volcanogenic geological formations. Further expansion leads to the expansion of the oceanic space with the deposition of metavolcanic-layered-carbonate-siliceous formation at the periphery of the spreading basin.

B. The stage of maximum opening of the Turkestan paleoceanic space, early subduction and the emergence of active continental margins $E-O_{2-3}$. The ocean is getting its maximum size. Active spreading in the center produces the accumulation of the ophiolite complex. In the conditions of intraoceanic troughs and uplifts, the accumulation of carbonate-siliceous-terrigenous strata took place, in the marginal oceanic - flyschoid terrigenous strata. In the south, the first underthrust and subduction of the oceanic crust is recorded under the Karakum-Tajik microcontinent, and the Obizarang ensialic island arc is formed. The outskirts of the Kyrgyz-Kazakh continent remain passive at this time.

Stage IV - convergence of lithospheric plates (convergent) - $O_{2-3}-C_2$ subduction.

A. The stage of partial reduction of the Turkestan paleospace, the initiation of the ensimatic island arc and the formation of the active margin of the Karakum-Tajik microcontinent $O_{2-3}-S_1$. The expansion of the paleoceanic space is replaced by its contraction. Subduction zones appear at the edges of the ocean. In the south, the Karakumo-Tajik microcontinent is built up by an accretionary wedge and, with continued subduction, ensialic island arcs (O_{2-3}) are formed. Terrigenous sedimentation (O_3-S_1) continues on the marginal oceanic uplifts. The ensimatic island arc (Kushkumbai, Baimen) originates in the ocean. The northern

subduction zone is built up by an accretionary wedge, and a deep-sea trench is formed.

B. The stage of completion of the active development of the Turkestan paleospace and the beginning of the formation of a magmatic arc on the active margin of the Andean type. S_2-D_1 . On the southern shoulder of the ocean, the origin and development of the accretionary wedge of the Katarmaitr (ankaramit-trachybasalt formation) occurs, and shelf deposits are formed. Subduction in the north contributed to the formation of a magmatic arc. Compression of paleoceanic space leads to crowding and regional metamorphism. The spreading zone is terminated.

C. Stage of relative dynamic rest $D_2 - C_1$. The convergence of lithospheric plates leads to overlap of the spreading zone. Carbonate shelf formations are being formed. The development of deep-water troughs with condensed sediments comes to an end.

D. The stage of closing the Turkestan paleoceanic space and the development of continental margins C_2 . The closure of oceanic space occurs as a result of unilateral pressure from the south. In the residual basin, the ensimatic island arc Tubabergen, Sangruntau, Shavaz is formed. The complete closure of the paleospace and further movement to the north leads to the clustering of structural-material complexes and the formation of gently sloping pre-folded nappes and thrust faults. Subduction processes caused a new impulse to activate the microcontinent and led to the formation of the Beltau-Kuramin magmatic arc. On the outskirts of the Karakum-Tajikistan microcontinent, the Vakhshivar rift structure is formed, the Gissar paleocean opens with the Sufi island arc, Sardor, which closes in the process of further movement.

V. Stage of collision and formation of the continental crust $C_2 m_2-P$.

A. The stage of formation of the accretionary prism of the Southern Tien Shan and the soldering of the $C_2m_2-C_3$ microcontinent. The collision of micro-continents occurs through an accretionary prism. The formation of integuments proceeds against the background of the complication of pre-folding nodules, their clustering and the formation of olistostromes. The energy of tectonic processes caused the melting of crustal material and the formation of S-type granitoids, which consolidated the structural-material complexes of pre-folded nappes. Tectonic structures of the nappe rank Turkestan-Alai, Kyzylkum, Zarafshan-Turkestan, Katarmay-Yagnob, Zarafshan-Alai, Osmontalinsk, Karatag-Ramit, Machetlins (Fig. 1) are formed. Sedimentation is preserved in the residual sea basins along the periphery of the accretionary prism. The growth of

asthenospheric traps continues under the accretionary prism.

B. Stage of maturation of the cortex and post-collisional activation of C_3-P . The maturation (stabilization) of the newly formed continental crust (South Tien-Shan) as a result of one-sided compression proceeds against the background of fold-block rearrangement, which manifested itself in the adoption of a close-to-vertical position of the shaded nappes, the emergence of a system of deep diagonal faults and renewal of transform and inter-cover disturbances, crumples, often embedded in early interformational structures of shaping (Fig. 1). Tectonic structures form a drainage network, providing deep permeability of the lithosphere, and serve as outflow channels for magmas that form granitoids of I-, S- and A-types.

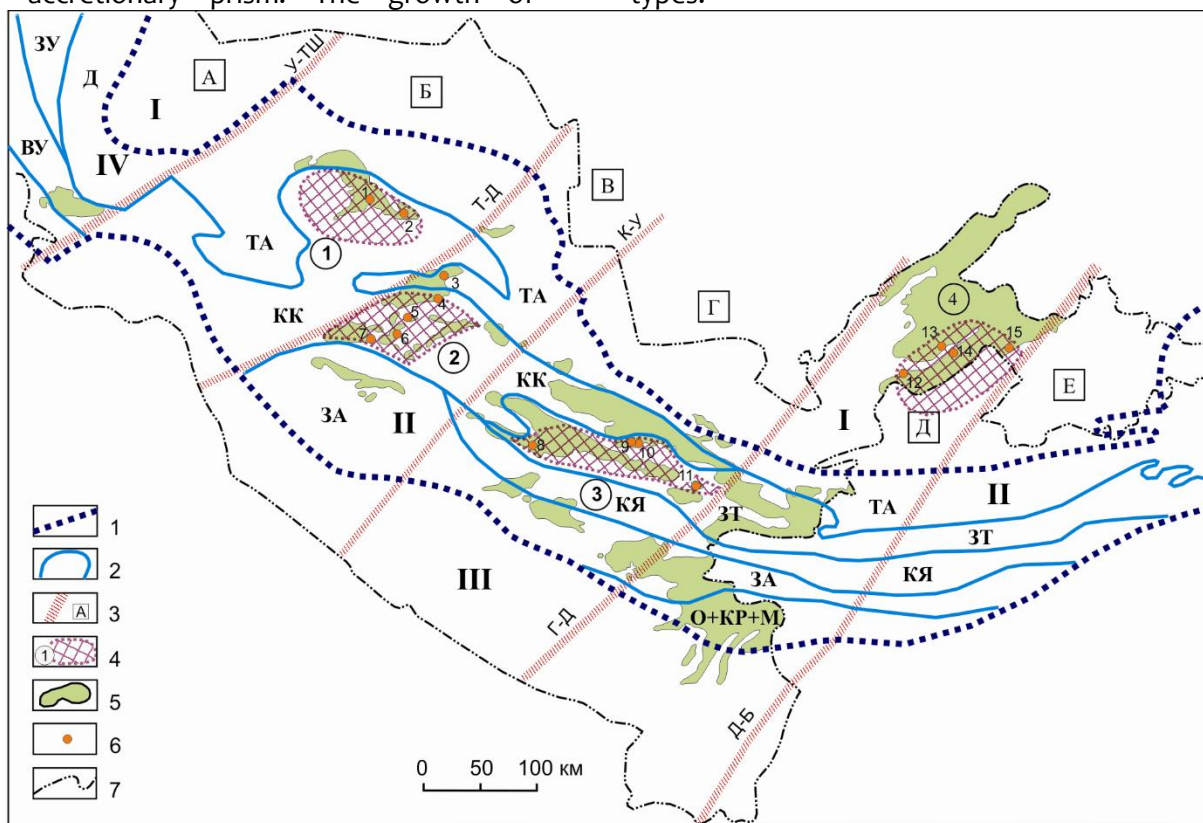


Fig. 1. Scheme of tectonic zoning of pre-Mesozoic formations of the South Tien Shan (Turkestan) nappe-fold area (based on materials by E.R.Bazarbayev, A.A.Zemlyanov, 1997, with additions, 2010)

1 - boundaries of geodynamic structures of the first order: I - Kyrgyz-Kazakh microcontinent (Northern and Middle Tien Shan), II - Turkestan paleo-oceanic space - nappe-fold area (Southern Tien Shan), III - Karakum-Tajik microcontinent (South-Western Tien Shan), IV - Ural paleo-oceanic space (Sultanuvais); 2 - boundaries of geodynamic structures of the II order of the paleo-oceanic space - covers: TA - Turkestan-Alai, KK - Kyzylkum, ZT - Zarafshan-Turkestan, KY - Katarmay-Yagnob, ZA - Zarafshan-Alai, O + KR + M - Osmantala, Karatag- Ramit, Machetlin, VU - East Uralsky (trough), ZU - Zaural (uplift), D - Denisov (trough); 3 - deep faults of the basement (transform?) - boundaries of geotectonic segments: U-TSh - Ural-Tianshan, T-D - Tuzkoy-Dzhartas, K-U - Karakumo-Uchbash, G-D - Guzarsko-Dzhizak, D-B - Dushanbe-Boztau (letter indexes - segments: A - Sultanuvay, B - Bukantau, C - Tamdytau, G - Nurata, D - Malguzarsky, E - Fergana); 4 - gold ore regions (1 - Bukantau, 2 - Tsentralnokyzylkum, 3 - Nurata, 4 - Angren); 5 - outcrops of pre-Mesozoic formations (mountain heights); 6 - gold ore and gold complex deposits (1 - Kokpatas, 2 - Turbay, 3 - Tamdybulak, Balpantau, 4 - Murantau, Myutenbay, 5 - Amantaytau, 6 - Daugyztau, Vysokovol (Au-Ag) 7 - Ajibugut, 8 - Sarmich, 9 - Guzhumay, Intermediate, 10 - Charmitan, 11 - Marjanbulak, 12 - Kalmakyr, Dalnee (Au-Cu), 13 - Kyzylalmasay, 14 - Kochbulak, 15 - Chadak); 7 - border of the Republic of Uzbekistan.

Inland rifts (Kyzylnura) and type A granitoids are formed on the Kyrgyz-Kazakh continent. The Karakumo-Tajikistan continent - the Khanaka complex - is developing in a similar way.

VI. Stage of intraplate continental development P_2 -T.

Penetration of the young orogen is accompanied by tectonic movements of a reverse-strike-slip nature, predominantly northeastern, intrusion of alkaline basaltoid

dikes and explosion pipes of the South Tien Shan complex. The geodynamic map reflects the location and tectonic elements at the stage of intraplate development. As a unit of events unrepeatable in the history of geodynamic development, each structural-material complex has a specific composition and structure inherent only to it, participating in the entire further history of the development and formation of structures of specific territories.

Tectonic zoning, carried out on the basis of an analysis of the history of the development of structural-material complexes, makes it possible to distinguish the following pre-Mesozoic structural elements, which, in fact, are geodynamic complexes of three orders (Fig. 1):

Geodynamic complexes of the 1st order: accretionary prism of the Turkestan paleo-oceanic space (Southern Tien-Shan); active outskirts of the Andean type of the Kyrgyz-Kazakh microcontinent (Middle Tien Shan); riftogenically activated Karakumo-Tajik microcontinent (Southwestern Tien Shan).

Geodynamic complexes of the II order - 8 accretion covers Turkestan-Alai, Kyzylkum, Zarafshan and Turkestan, Katarmay and Yagnob, Zarafshan and Alai, Osmantalin, Karatag and Ramit, Machetlin; 3 blocks of the magmatic arc of the Kirghiz-Kazakhstan microcontinent Severonuratskiy (front part), Kuramin (central), Chatkalye (rear-arc); 2 activated blocks of the Karakum-Tajikistan micro-content Baysun, Kugitang; Sultanuvizdag (Sultanuvais) cover structure of the Ural paleo-oceanic space.

Geodynamic complexes of the III order are large blocks within the boundaries of geodynamic complexes of the II order, differing in the features of the structure and combination of structural-material complexes, the intensity and specificity of tectonic-

magmatic processing of the structural-material complex by the processes of late and postcollisional activation.

Metallogenic zoning of the territory of the Republic of Uzbekistan into primary gold mineralization is based on the analysis of ore-forming geodynamic factors of various hierarchical levels (Kazakbaeva S.M. et al., 1997). As a taxonomic unit of several levels, geodynamic complexes were used, which are understood as geological blocks formed by late- and post-collisional processes, representing various combinations of structural-material complexes and having individual geological characteristics by the time of the formation of industrial gold mineralization. The history of each geodynamic complex is considered from the point of view of the contribution and influence of geodynamic environments on the formation of gold concentrations in the ore-preparation period, synchronous with ore deposition and post-ore. Metallogenic zoning is based on a spatial analysis of ore-forming factors and their signs and gold productivity geodynamic complexes (Fig. 2).

On the territory of Uzbekistan, three gold-bearing metallogenic provinces have been identified - the Sredinnotyan (Kyrgyz and

Kazakhstan), South-Tian-Shan (Turkestan), III - Southwest-Western (Karakum And Tajik), positionally coinciding with the geodynamic complexes of the I order: collisional compression - accretionary prism - for the Late Hercynian period), the Karakum-Tajik microcontinent.

Metallogenic zones reflect the ore-geochemical specialization of large blocks of the earth's crust for gold rank II order geodynamic complexes and include the most productive III order geodynamic complexes. Thirteen metallogenic zones have been identified, of which three with intensive gold mineralization (Kuramin, Kyzylkum, Zarafshan and Turkestan, which have northern and southern branches), nine metallogenic zones with extensive gold and gold-bearing mineralization, and one potential metallogenic zones (Beltau cover) (covered by cover) Mesozoic-Cenozoic deposits.

Three metallogenic zones in the Middle Tien Shan metallogenic provinces correspond to megablocks belonging to different parts of the magmatic arc: the area of areal volcano-plutonic activation on the active continental margin - the Kurama metallogenic zones and the Beltau potential metallogenic zones, in the rear arc part - the Chatkal metallogenic zones.

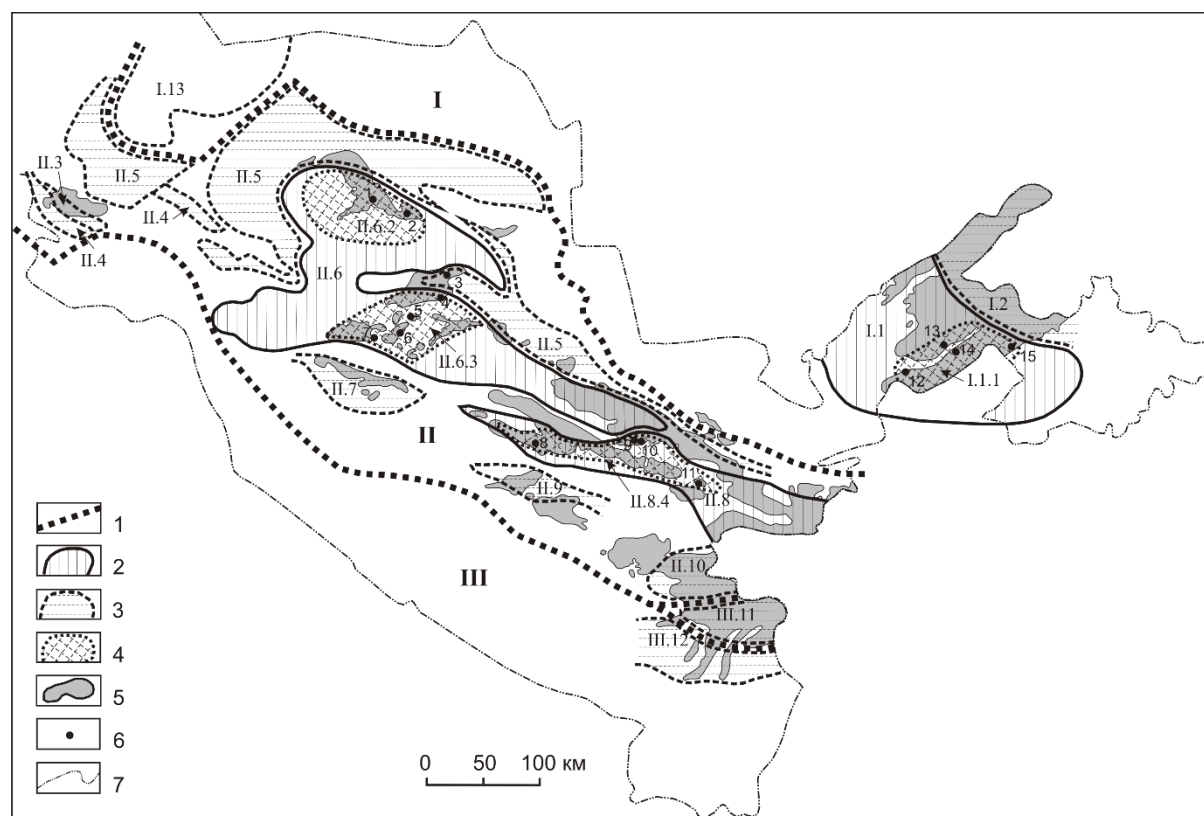


Fig. 2. Scheme of metallogenetic zoning of endogenous gold mineralization in Uzbekistan (according to Golovanov I.M., Horvat V.A., Koloskova S.M., Zavyalov G.M., Rakhmatullaev Kh.R., Dzhanatuganov N.I., Yezhkov Yu. B. et al., 1997).

1-4 - metallogenetic subdivisions and their numbers (the first digit is a metallogenetic province, the second is a metallogenetic zone, the third is a gold-ore region): 1 - metallogenetic provinces (I - Sredinnotyanshan or Kirghiz-Kazakhstan, II - South Tien Shan or Turkestan, III - Southwest Tien Shan or Karakum-Tajik), 2 - metallogenetic zones of intensive gold mineralization (I.1 - Kuramin, II.6 - Kyzylkum, II.8 - Zarafshan-Turkestan, 3 - metallogenetic zones of extensive gold and gold-bearing mineralization (I.2 - Chatkal, II.3 - Sultanuvai, II.4 - Sheikhdzheilin, II.5 - Turkestan-Alai, II.7 - Kuldzhuktau, II.9 - Katarmay-Yagnob, II.10 - Chakylkalyan, III.11 - Gissar, III.12 - Baysun, I.13 - Potential Beltau), 4 - gold ore areas (I.1.1 - Angren, II.6.2 - Bukantau, II.6.3 - Tsentralnokyzylkum, II.8.4 - Nurata); 6 - gold and gold complex deposits (1 - Kokpatas, 2 -

Turbai, 3 - Tamdybulak, Balpantau, 4 - Murantau, Myutenbay, 5 - Amantaytau, 6 - Daugyztau, High-voltage (Au-Ag) 7 - Ajibugut, 8 - Sarmich, 9 - Guzhumsay, Intermediate, 10 - Charmitan, 11 - Marjanbulak 12 - Kalmakyr, Dalnee (Au-Cu), 13 - Kyzylalmasay, 14 - Kochbulak, 15 - Chadak); 7 - border of the Republic of Uzbekistan.

In the South Tien Shan metallogenetic provinces, eight metallogenetic zones are identified in the volume of nappes formed in various geodynamic settings; they are distributed both over the entire cover and its parts, depending on the areal development of gold-producing geodynamic complexes of the III order. In the South-West Tien Shan metallogenetic provinces, three metallogenetic zones of extensive gold and gold-bearing mineralization are distinguished.

Within the metallogenic zones of intense gold mineralization, there are four gold-ore regions - Bukantau, Central-Kyzylkum, Nurata, Angren, the boundaries of which are delineated by gold-producing geodynamic complexes of the III order. Let us consider successively the general character of gold-bearing metallogenic zones (Kazakbaeva S.M., Golovanov I.M., Horvat V.A. et al., 1997).

RESULT AND DISCUSSION

Metallogenic zones of intense gold mineralization.

I.1. Kuraminsk - the nature of gold content is mainly concentrated in ore clusters, where it is represented by traditional volcanogenic-hydrothermal mineralization associated with the basic gold-copper-porphyry formation; there are numerous manifestations of gold-complex mineralization of other ore formations.

II.6. Kyzylkum - represents the "ore axis" of the South Tien Shan, and ore regions - two gold concentrates. The character of gold content is mainly concentrated, mainly in ore zones, where the entire horizontal row of ore formations, traditional for Western Uzbekistan, is manifested; unconventional mineralization such as organo-gold or intermetallic compounds can be manifested in zones of deeply penetrating faults with deep carbonaceous matter.

II.8. Zarafshan-Turkestan - is, as it were, the eastern continuation of the "ore axis" of the Southern Tien Shan, breaking up into a number of branches - ore zones and potential ore zones. In the ore zones, the Kyzylkum series of ore formations is concentrated, in a predominant vein-vein expression. It is possible to reveal the final ore link - gold-silver mineralization, which is still absent in industrial parameters. Under the conditions of increased compression of the Nurata segment,

unconventional mineralization is possible in granitoids, quartzites, and other brittle rocks (Kirkland Lake type).

Metallogenic zones of extensive gold and gold-bearing mineralization.

I.2. Chatkal - dispersed; gold in an impurity form is found in ore objects of various genetic groups and metals; own deposits are few in number and are of interest for artisanal mining.

II.3. Sultanuvays - dispersed, with possible manifestation of mineralization of the Kyzylkum type in black shale strata.

II.4. Sheikhdzheilina - dispersed, with a gold content unconventional for Uzbekistan type - due to weak pyrite mineralization and, possibly, porphyry copper mineralization. Increased gold content is possible in the zones of regenerated pyrite mineralization.

II.5. Turkestan-Alay - mostly dispersed; productive associations are represented by late sulfide-silver formations, suitable for heap leaching and artisanal mining; there are prerequisites for unconventional gold mineralization associated with the regeneration of pyrite ores, as well as scattered gold associated with carbonaceous formations in deep fault zones; gold-bearing skarns with magnetite and chalcopyrite are possible.

II.7. Kuldzhuktau - dispersed with local concentration in the Taushan ore zone, where the Kyzylkum formation series is manifested; unconventional gold mineralization of magmatic type can be traced in gabbro-norite intrusions, as well as close exocontacts of the Mingchukur intrusion (gold-bismuth productive paragenesis).

II.9. Katarmay-Yagnob - potential of gold content, realized in the Katarmay ore zone, where gold-quartz mineralization in numerous ore objects has reached a concentration

corresponding to industrial mining. Prospects for other industrial types are possible.

II.10. Chakylkalyan - weakly concentrated and dispersed character of gold content with the manifestation of two different-age formation series - the traditional Kyzylkum and younger with gold-bearing formations (antimony, mercury); a number of objects show signs of Karlin type mineralization.

III.11. Gissar and III.12. Baysun - sharply dispersed character of gold content; the presence of increased gold content of pyrite ores and signs of regeneration of the latter with the manifestation of non-standard gold mineralization.

I.13. Beltau (potential) - the nature of gold content, apparently, will correspond to the Kuramin metallogenic zones.

For each metallogenic province, general and individual features of metallogeny

have been established, a certain evolutionary sequence of manifestation of gold and gold-bearing formations and age regression series (families) of ore formations with industrial gold mineralization (Table 1). In the Middle Tien Shan metallogenic provinces (Chatkalo-Kuramin region), most researchers accept two stages of the formation of industrial gold mineralization (Zavyalov G.E., Islamov F.I., Arapov V.A., etc.) In the South Tien Shan metallogenic provinces (Kyzylkumo-Nurata region) justified one age series of gold-bearing formations (Horvat V.A., Klempert S.Ya., Rakhmatullaev Kh.R., Bertman E.B., etc.). In the South-West Tien Shan metallogenic provinces (South Uzbekistan region), two families of ore formations have been identified, with which gold mineralization is associated (Terletskiy O.G., Dzhantuganov N.I.).

Table 1

Gold ore and gold-bearing formations of Uzbekistan

(Based on materials from Voronich T.M., Zavyalov G.E., Golovanov I.M., Horvat V.A., Klempert S.Ya., Terletskiy O.G., Dzhantuganov N.I., Koloskova S.M. and etc.)

Ore formations	Typical objects
I. Middle Tien Shan metallogenic provinces, families of ore formations: I. Cu, Mo, Au_{1,2} → As, Au₃ → Pb, Zn, Te, Ag, Au₄ (age interval of formation C₂-P₁). II. Cu, Bi → Au₁, Ag → Ag, Au₂ → Pb, Zn → F (P-T₁)	
1. Copper-porphyry gold bearing 2. Gold ore 3. (Silver) -gold 4. Silver-gold with tellurium 5. Silver-gold 6. Gold-silver	Kalmakyr, Far away Akturpak, Sarta-Butkan Kauldy, Kyzylalmasai Kochbulak, Kairagach Pirmirab, Guzaksai Revashte, Arabulak
II. South Tien Shan metallogenic provinces, family of ore formations: W, Mo → W, Bi, Au₁ → As, Au₂₋₃ → Sn, Pb, Zn, Au₄ → Ag, Au₅ → Sb, Ag → Hg, Au₆ (C₃-T₁)	
7. Rare gold ore 8. Arsenic-gold ore, vein-disseminated ores 9. Arsenic-gold ore, vein-vein ores 10. Polymetal gold 11. (Gold) –silver 12. Gold-argillite 13. Tungsten bearing skarns and skarnoids, gold bearing 14. (Zink) -Copper pyrite, gold	Muruntau, Myutenbay, Charmitan, Turbay (Guzhumsai, Intermediate) Kokpatas, Daugyztau, Amantaytau Biran, Sarmich, Taushan, Guzhumsai, Intermediate Sentyab, Karakutan, Beskuduk Visokovoltniy, Kosmanachi, Okzhetpes, Western Turbay Akata, Akba. Southbay, Sarytau, Koitash Karamurun.
III. Southwest Tien Shan metallogenic provinces, family of ore formations: I. Pb, Zn, Cu, Ag, Au₁ → Au₂, Ag (C₁-P₁). II. Au₁ → Au₂, Ag (C₂₋₃-T)	
15. Copper-pyrite, gold-bearing 16. Pyrite-polymetallic, gold-bearing 17. Silver-gold 18. Gold ore 19. Gold-silver	Dondonchokan Handiza, Chakchar, Vuari Chinarsay, Boynak Glacier, Eagle Chairli, Jamesonite

The pre-Mesozoic formations of the Central Kyzyl Kum and Nurata Mountains have a history of geological development characteristic of the region as a whole, while possessing a number of individual characteristics of the geological structure and ore content. The region is complex of intensely block-forming tectonic faults, widespread development of folded, nodular-thrust and local fracture structures. The structural features are reflected in the updated geodynamic scheme by dislocated pre-Mesozoic formations, which are represented by two main types of rocks: sedimentary - metamorphosed terrigenous, volcanic, volcanogenic-sedimentary, siliceous and carbonate rocks of the PR-C₂ age, and intrusive age C₂-P. A feature of the tectonic structure is the predominant sublatitudinal and northwestern direction of strike of early tectonic structures, transverse - of later pre-Mesozoic formations with a removed sedimentary cover of a scale of 1:200,000, supplemented by ore load to study the patterns of mineralization distribution of 15 noble, colored and rare ore formations. Metals and interpretation of geochemical fields.

Zoning was carried out according to the conditions of geochemical work, taking into account landscape conditions, types of geochemical halos and the depth of the Pre-Mesozoic basement. Ortho-eluvia autochthonous geochemical landscapes within mountain elevations and landscape areas are most favorable for carrying out lithochemical searches in primary halos, secondary halos and scattering streams.

Thematic work on the compilation of a map of geochemical zoning at a scale of 1:200,000 included a set of studies. The regional background was calculated for 18 chemical elements. Formation geochemical analysis and determination of the geochemical specialization of rocks were carried out for the geodynamic complexes of the fold-nappe

formations of the Turkestan paleocean. Geochemical models of ore fields of the main types of gold mineralization have been developed, elements-indicators of endogenous mineralization of various ore-formational affiliation have been determined. A common feature of the distribution of halos of chemical elements is the zonal geochemical structure, characteristic of ore-geochemical systems with a convective mechanism of substance differentiation. Based on the stable manifestation of the zonal distribution of geochemical halos in the reference gold fields, this informative feature can be considered as a structural-geochemical predictive criterion.

The automated processing of the areal database was carried out using the methods of multivariate statistical analysis (Statistica-6) and spatial visualization of monoelement halos and geochemical associations (GoldenSurfer, WinGeoScan).

CONCLUSION

The geochemical zoning map shows geological formations with different specialization and contrasting distribution of siderophilic, lithophilic, chalcophilic groups of elements in rocks as a potential source of ore components. As a result of a comprehensive interpretation of geological and geochemical information, 35 geochemical nodes and zones with a disturbed primary distribution of elements with known and predicted mineralization of noble, non-ferrous and rare metals were identified, of which 17 are within mountain elevations and 18 are in closed areas with a depth of the pre-Mesozoic basement 100-1100 m. A feature of the focal geochemical structures controlled by intrusive bodies is the presence of combined geochemical halos accompanying the early, high-temperature copper-nickel (Cu, Ni, Co, Cr, Au, Pt) rare metal (W, Sn, Mo, Bi, Ta, Nb, Be, Li) and medium-low-temperature gold (Au, As, Zn, Cu, As, Pb, Sb, etc.) mineralization. Linear geochemical structures are developed along

extended tectonic zones, characterized by the development of halos accompanying medium-low-temperature mineralization (Au, Ag, Cu, As, Pb, Sb, etc.).

The created set of medium-scale geochemical maps of the new generation will contribute to increasing the reliability of conclusions in the selection of objects for further exploration for precious, non-ferrous and rare metals and will serve as a geochemical basis for metallogenic analysis, remote sensing, regional geological work, and other areas of study of the potential of endogenous useful minerals of noble (Au, Ag, platinoids), nonferrous (Cu, Ni) and rare (W, Mo, Sn, Ta, Nb, Be, Li) metals in the depths.

At the stage of field research, a set of works on lithochemical sampling on primary and secondary halos was carried out, which, along with lithochemical methods, included reconnaissance routes, survey of mineralized zones, compilation of points of detailed geological observations. A new promising area for rare metal-gold mineralization was allocated. Practical recommendations on the prospects for ore content and methods of studying predicted geochemical nodes and zones in closed areas.

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