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GEODYNAMICS AND METALLOGENY OF TEKTURMAS OPHIOLITE BELT

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Abstract. On the basis of structural, petrochemical and isotope-geochronological (Sm-Nd) methods, the absolute age of the deep rocks was determined. A geodynamic model of the development of the Tekturmasi ophiolite belt has been created, providing for its formation in the form of a fissured rootless melange embedded in a tectonic zone.

According to the authors, the Tekturmasi ophiolite belt is not a classic belt aroused out of subduction of the oceanic plate under the Kazakhstani continent, but fissured bottomless melange, as part of the Itmurundy melange, embedded in a pre-existing tectonic weakened area.

Tekturmas ophiolitic melange has a lot in common with Itmurundin. The nearest proximity of Tekturmas and Itmurundy belts and the aforementioned congruity of their rock assemblage may be due to the fact that the TOB is formed with the involvement of Itmurundi ophiolite belt.

New data on the structure of the Tekturmasi ophiolite belt are given, which make it possible to briefly formulate a model of its appearance in this part of Central Kazakhstan.

According to the results of the Sm-Nd isotope analysis, it turned out that all samples of the basic igneous rocks indicated a single source – the depleted mantle, i.e. that part of the mantle, which, even at the earliest meltings 1.8 and 2.4 billion years ago, through out from itself a low-temperature and low-melting fraction, on the basis of which the Archean and Proterozoic shells were decorated, which collected rare metals, polymetals, barite, manganese and other metals with large ionic radii.

Isotopic analysis showed that the region was not prospective for copper-porphyry metallogenesis, but for copper-nickel metallogenesis with the participation of precious metals.

Key words: Tekturmas ophiolite belt, Itmurundy melange, geodynamics, subduction, exhumation, volcanic belt, isotope-geochronological (Sm-Nd) studies, copper-porphyric, copper-pyrite deposits.

A new geodynamic model of Tekturmas ophiolite belt. Tekturmas ophiolite belt (TOB) bears the marks of a fault structure, the core of which is a horst folded by the serpentinite melange of problematic Lower Ordovician age and alkaline basalts of the Karamurun Suite (O_{1-2}). Novikova Z.M. [2, 3] named this structure "Tekturmas projection".

This region has no signs associating ophiolites with subduction conditions, since there is no oceanic setting in the nearest surroundings and there is no sura-subduction volcanic belt.

The nearest oceanic setting occured in the Early-Middle Devonian in western Zhongaria, where in ophiolites the Devonian conodonts were found and described [4]. In terms of the age of the rocks that the Tekturmas projection cuts through, age of its starting tectonic activity coincide with the Ordovician. This belt belongs to a series of so-called "wandering ophiolites," which, due to their rheological properties and ultrahigh pressures, use weakened tectonic zones in order to move into the lower pressure area.

Tekturmas ophiolitic melange has much in common with Itmurundy, but there are some differences. Both melanges are dominated mainly by basalts and phtanites. Basalts are of oceanic origin, prevailing in the areas of subaqueous plateaus and ridges, they are of alkaline series, with high contents of phosphorus and manganese (Novikova et al., 1977). Arc volcanites are predominantly included into the Tekturmas melange, although they are usually located outside the serpentinite belt and belong mainly to the Middle-Late Ordovician. Both melanges contain a fraction of trachytes and pantellerites, a complex of Early-Middle Ordovician red phantites, and jaspers with conodonts of corresponding age. The difference consists in the presence of high-pressure rocks in the composition of the Itmurundy melange: jadeitite, garnet amphibolites and blue slates, which are not observed in Tekturmas. If this exception is explained by a different level of the source of dewatering of allochthonous inclusions in melanges, then the assumption of relatedness and even age of these two melanges becomes very acute.

According to the authors, TOB is not a classic belt aroused out of subduction of the oceanic plate under the Kazakhstani continent, but fissured bottomless melange, as part of the Itmurundy melange, embedded in a pre-existing tectonic weakened area (figure 2). To explain reasons for occurrence of the TOB of a clearly fractured type, but in composition identical to Itmurundy type, only the exhumation model is suitable. Subduction models in this case contradict several arguments:

– the concept of the subduction process involves the submersion of terrestrial lithoplates of different composition into the mantle, processing them under the influence of high pressures and temperatures to a magmatic state and mixing with the mantle matter, or penetration into the sub-subduction plate in the form of volcanoes; thus, without an exhumation mechanism, Itmurundy ophiolitic lithoplates were supposed to disappear in the bowels of the Earth; however, in the Tekturmask melange there are numerous inclusions of fragments of the lower and upper crust;

– in the nearest environment there is no oceanic setting of the Early, Middle Paleozoic age, our data, as well as [6], as V.G. Stepanets indicates: “none of the criteria for determining the oceanic setting in the water area of Tekturmas at the time (O_1 - S_1) has been established”;

– there is no volcano-plutonic belt of the same age. The existence of sub-subduction volcanic belts is a necessary consequence of the manifestation of subduction processes.

The nearest proximity of Tekturmas and Itmurundy belts and the aforementioned congruity of their rock assemblage may be due to the fact that the TOB is formed with the involvement of Itmurundi ophiolite belt. Hypothetical model of the formation of the TOB belt is shown in figure 1.

Greater part of the events shown in figure 1 are dated by U-Pb zircon methods in laboratories in Russia and China.

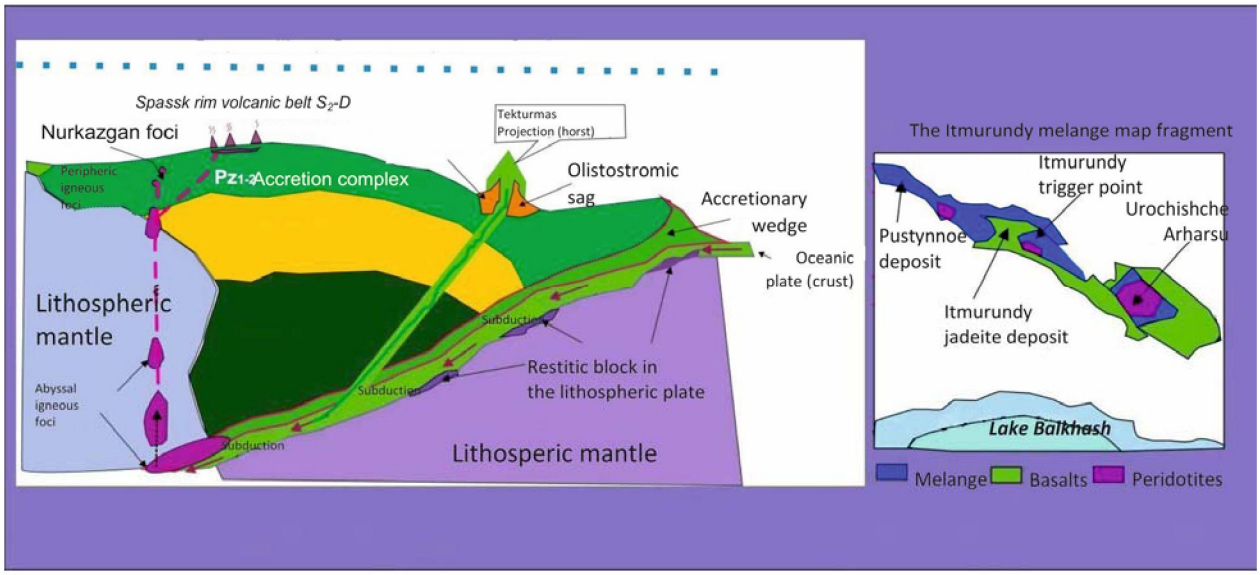


Figure 1 – Hypothetical scheme of all geodynamic events in the region for geological time O_2-D_2

Starting time of the Itmurundy subduction (right flank of the figure) has not been identified, but metamorphic rocks date 463 Ma (middle Ordovician), which survived high and ultrahigh pressures and reached the surface as a result of exhumation [7]. Ithmurundy subduction can be considered real by the following features:

The oceanic crust of the subduction body (slab) always rests on the lithospheric mantle, and during subduction it lugs the fragments away of the lithospheric mantle, most often its solid restites. In Itmurundy melange, such fragments of the lithospheric mantle were found and studied. We marked them in three places (inset map in figure 1); the largest body is Arkarsu Mountains, the next two are megaboudins on the southern floor of Itmurundy Mountain and in the melange north-west of the Itmurundy jadeite deposit. They are composed of peridotites and consist mainly of green clinopyroxene and olivine;

– the tectonic injection of a subdued Itmurundy melange into a tectonic weakened zone in the form of a horst on the southeastern flank of the continent occurred in O_2. The implementation mechanism could be twofold:

– after the amphibolites of the oceanic plate transformed to the state of serpentinite mass, the slab volume increased significantly, the overpressure that moved this mass into the previously formed fault tectonic structure, which acted as the receptacle of Itmurundy melange immersed in the mantle;

– probably, a collision mechanism could be involved in the form of oceanic plate overpressure on the slab sinking into the mantle, with subsequent injection into the tectonic structure;

– at approximately 100 km depth, the accretionary wedge turbidites and all hydroxyl-containing minerals are completely dehydrated. The released water is absorbed by the mantle, while the temperature gradually decreases, and partial magmatic melts form abyssal foci;

– since the magmas get gas-saturated, they move to the upper horizons via zones of weakness and form peripheral foci in which Nurkazgan-type ore deposits are formed. This time is 452-427 Ma (late Ordovician – early Silurian) [7, 8, 9];

- same peripheral foci fed the near-surface foci of the Edge volcanic belt as well [11].

The distance on the surface between Itmurundy and Tekturmas melange is about 300 km. Their intersection in the subsoil requires gentle plunge of Itmurundy melange. It is noteworthy that most of the subduction areas are absorbed in the mantle at a steep angle, up to 90°, but there are exceptions, for example, subduction of the Pacific plate under South America has a slope of about 30 degrees, subduction under the island of Honshu has an opposite, steep, eastern orientation. If these facts take place globally and on a scale of geological time, then gentle plunge is no exception for Central Kazakhstan.

It is thought [11] to be that the formation of glaucophane schists and complete dehydration of the accretionary wedge sediments in subduction structures occurs at 90-100 km depth, i.e. directly below the border of Mohorovicic. All the water is consumed for the formation of serpentinite. Because of its special rheological properties, melange plunge into the tiniest and any tectonic faults, trying to evacuate the overpressure. Thuswise, wandering bottomless ophiolite belts and their fragments appear. TOB is subsumed into these ophiolites. Assumingly, the exhumation in the Tekturmas tectonic area kicked off when it crossed the Itmurundy subduction area at a depth of about 100 km. When moving up, melange captured and carried away all that was in the Itmurundy melange, as well as fragments of enclosing roof and floor.

The represented new data about the TOB structure, allows us to summarize its occurrence model in this part of Central Kazakhstan. On the eastern slope of the Central Kazakhstan Caledonian continent on the border with the Balkhash residual shallow basin a tectonically weakened zone is formed. It is intruded with the serpentinite melange, which is an abyssal fragment of the Itmurundy subduction package, which includes the oceanic crust and sediments of its accretionary wedge, as well as fragments of previously introduced intrusive bodies of different composition, including gabbroids, granitoids, and gneisses of this continent. Intrusion occurs under high pressure with elements of spreading of a tectonically weakened area, whereby the tectonic gap in some areas of the tectonic area has a width of several km, and in others - a few hundred meters, or expressed as a “dry” seam filled with breccias, milonite or tectonic shale.

Geodynamics and composition of magmatic complexes. In petrochemical sampling analysis of M.Z. Novikova et al. [2, 3] oceanic basalts dominate, as indicated by the abundant phthanites in these basalts, which is undoubted evidence of the subductional situation in the history of education and existence with respect to the central Tekturmas projection composed of serpentinites and pillow basalts, but not in case of the whole Tekturmas.

In the sampling of analyses by R.M. Antonyuk [12], the ratio of rocks is different: 28% of samples of oceanic rocks versus 72% of samples of island arc rocks. This means that in the history of Tekturmas, presumably in the Middle and Late Paleozoic, inclusions of accretion rocks of the enclosing rock (gabbro and gabbro-amphibolites, Kuzek suite, dolerites and gabbro-dolerites, Baidaulet suite) were impregnated into the structure of Tekturmas proper protrusion formed tecturmas ledge. The ratio of oceanic and island-arc (or marginal-continental (?) Basaltoids) given in [12] indicates the existence of a terrestrial volcanic belt or paleo-tectonic fault at the Tecturmas site in the Early Paleozoic.

There are three structural-formational areas [2, 3, 12] in the structure of Tekturmas melange: Axial Tekturmas; North-Western, Bazarbaiskaya at the joint of the axial ophiolitic projection and Spasskaya metallogenic zone; Southeastern Sarysuyskaya at the joint of the axial projection and the Uspenskaya rare-metal metallogenic area, framing Tekturmas from the southeast.

The geological map of the TOB with elements of the longitudinal structural and formational zonation is shown in Figure 2.

The axial Tekturmas area runs in the northeastern direction for more than 40 km and show up clearly both on the map (solid purple belt and in figure 2) and in relief.

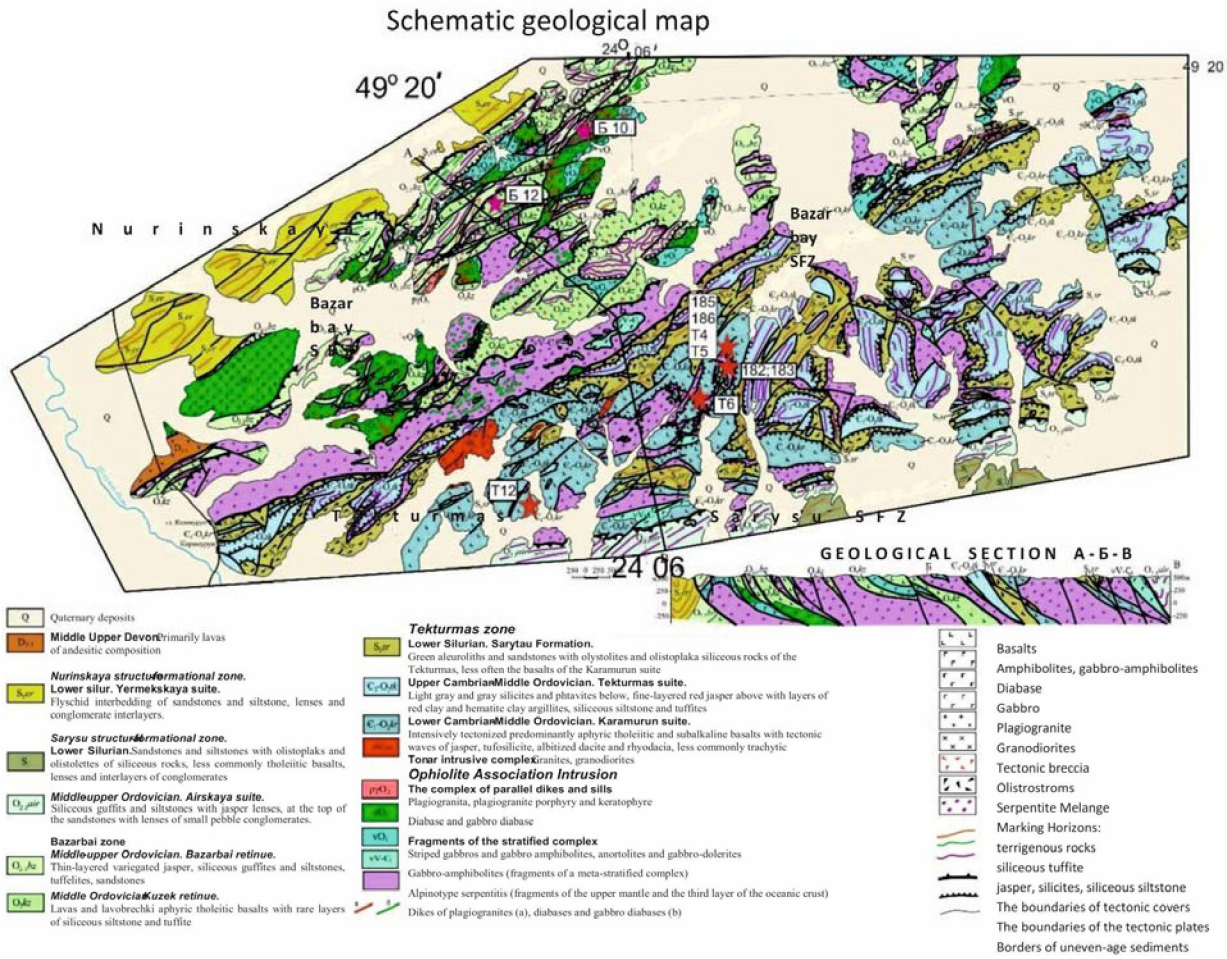


Figure 2 – Schematic geological map with sampling points from the TOB, selected for samarium-neodymium analysis (red stars and their numbers)

The composition and structure of the topological magmatic complexes in comparison with similar complexes of the Itmurundy melange are shown in figure 3.

According to M.Z. Novikova [1, 2] volcanics are rich in Nb (35-42 g/t), V (185 g/t), Ba (350-460 g/t), Sr (300 g/t). Zr (278 g/t), Rb (27 g/t), Y (29 g/t) and sharply depleted Cr (10 g/t), Ni (50 g/t), Co (23 g/t) and Mg (5,59 wt.%), such a spectrum of small elements asserts the melting of basalts from the enriched

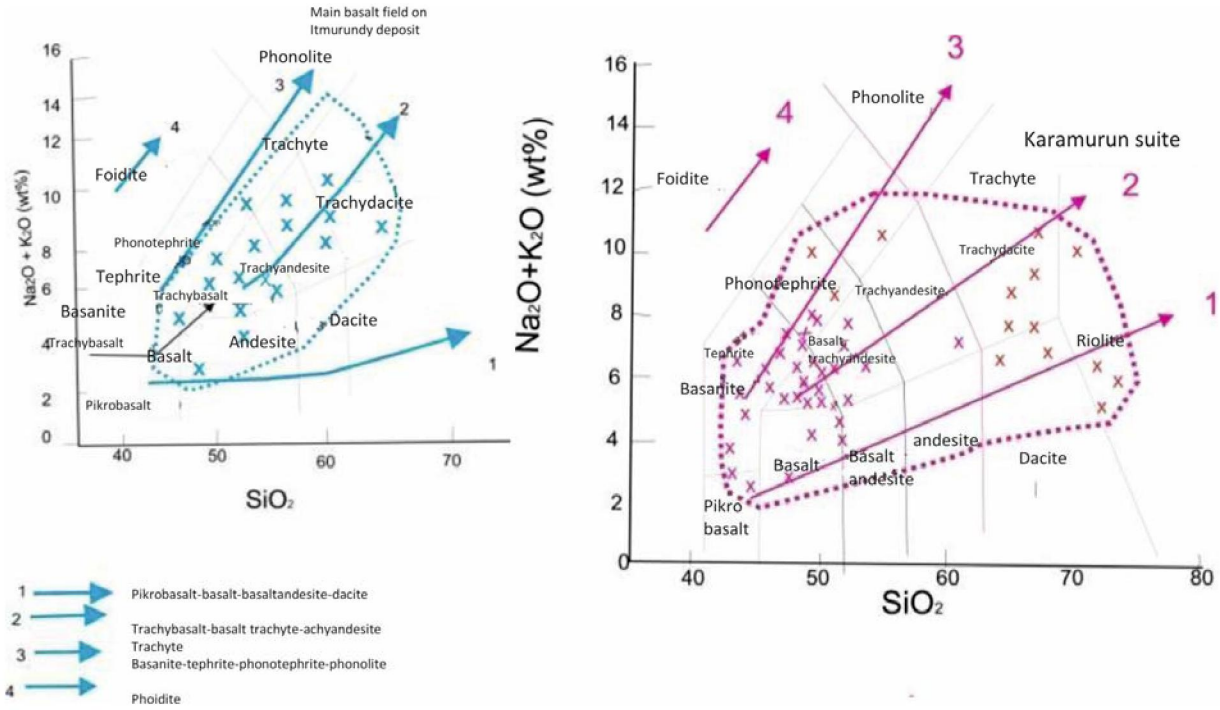


Figure 3 – Chemical classification and nomenclature of rocks of the Itmurundy (left diagram) and Tekturmas (right diagram) belts. The figure shows petrochemical series:
1 – calc alkaline; 2 – subalkalic; 3 – alkaline; 4 – ultra-alkaline

low-temperature mantle already deprived of the high-temperature restite at an early stage. This history of the development of a magma chamber is confirmed by the concentrations of the main elements: TiO_2 = 1.5 or more %%; FeO_{total} 12-14 %% and more; P_2O_5 – 1.5 and up to 3 %, as well as strong dependence of the amount of alkalis on the concentration of silica.

In the diagram in figure 4 samples 3, 7 - basalts from the Kushek suite of the Bazarbai zone (fractional index La/Lu = 1) look classic N-MORB, and the curves, in the form of a nearly straight line, to include most of the samples from Karamurun suite in the axial Tekturmas zone, as well as in olistho-strome Sarysu suite of the same name zone belong to the category of E-MORB: fractionation indices La/Lu=100-150 (see curves 1.5), curves with clear inclination from right to left. Sources of such basalts are different: E-MORB are formed in areas of hot fields, plumes and subaqueous ridges and high-mountainous plateaus, and N-MORB, on the contrary, away from plumes and hot fields up to 500 km or more.

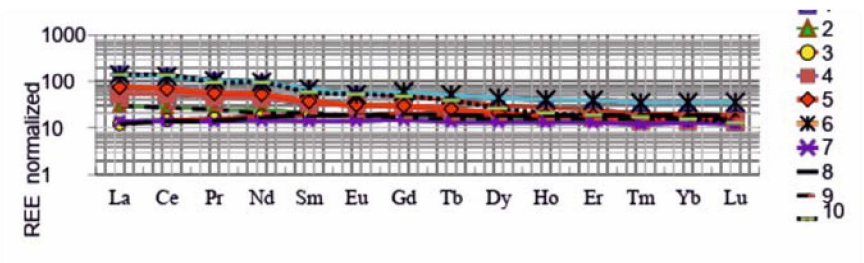


Figure 4 – Rare-earth composition of Tekturmas basaltoids: 1, 4, 5 - basalts of the Karamuryn suite of the axial Tecturmas area; 6 - andesibasalts of the Karamuryn suite of the axial area; 3, 7 - basalts of the Kuzek and Bazarbay formations; 2 - andesibasalts of the Kuzek Formation; 8-10 - world petrochemical types of basalts: 8 - N-MORB; 9 - E-MORB; 10 - ocean islands

Bazarbay structural-formational zone. The Bazarbai zone bounds the ophiolite belt from the north and is its northern border. It is composed at the base of lavas and lavobreccias of aphyric tholeitic basalts, which are shifted up the section by a variegated jasper, siliceous tuffites, siltstones, tuffelites and sand-stones. This complex of rocks is divided into two suites: Kuzek volcanogenic-sedimentary (O_2) and

Bazarbai sedimentary (O_{2-3}). According to the geologists of Moscow State University (Z.M. Novikova and others), the above-mentioned volcanic complex is described under the name "Bazarbai" complex. Forward to the north, the olistostromoflychoid complex S1 replaces the Bazarbay retinue.

A model of subduction genesis, as shown above, has no confirmation for Tekturmas, and the fault nature of this structure is obvious (figure 1) and the horst structure is verified by sedimentary troughs, which are filled with siliceous and flyshoid on both sides to the north and south of the horst - polystostrom complexes, which is typical for all horst structures. The presence of volcanic rocks, basalts, picrobasalts and dacites in this zone indicates the volcanic nature of this regional fault. The genetic relation absence between Bazarbai and Karamurun complexes is indicated by the sources of their magmas, strongly alkaline Karamurun ocean type and the calc-alkalic Bazarbai complex, which unambiguously indicate the peri-continental environment (figure 2).

Sarysu structural-formational zone bounds the TOB from the south-west. It is composed mainly of flyshoid and olistostrom complexes, in which the autochthonous material is only a matrix composed of turbidite. Rest of bodies are allochthonous, injected into these complexes as a result of the destruction of the axial ophiolite horst. The sizes of olistolites and olistoplak vary widely, therefore they were sometimes placed in the ranks of independent complexes (suites). These are Zongar, Karashoshak and Satybai.

Comparing the Sarysu and Bazarbai zones, it can be seen that the stone composition and age of the suite is almost identical and close to the composition of the classical olistostrom complexes. Their basis consists of turbidites of different grain sizes and different compositions. Their fillers are serpentinite, jasper-quartzite and basaltic olystolytes and olistoplak. Basalts in the Bazarbai zone have a distinct calc-alkaline composition, usually associated with the situation of oceanic and continental feestoon islands and active continental borderlines.

In the Sarysu zone (figure 5), olistoliths and olistoplaks have subalkaline and alkaline composition, which means that the source of olistolites and olistoplak was the central horst ledge in terms of its erosion and destruction. The fundamental difference of the magmatic sources can be affirmed by comparing these basalts with those of Tekturmas zone, the basalts of the Tekturmas zone most likely originated in the areas of oceanic plateaus and mountains, and the basalts of the Bazarbaisky suite in the area of oceanic and near-continental arcs – active continental margins.

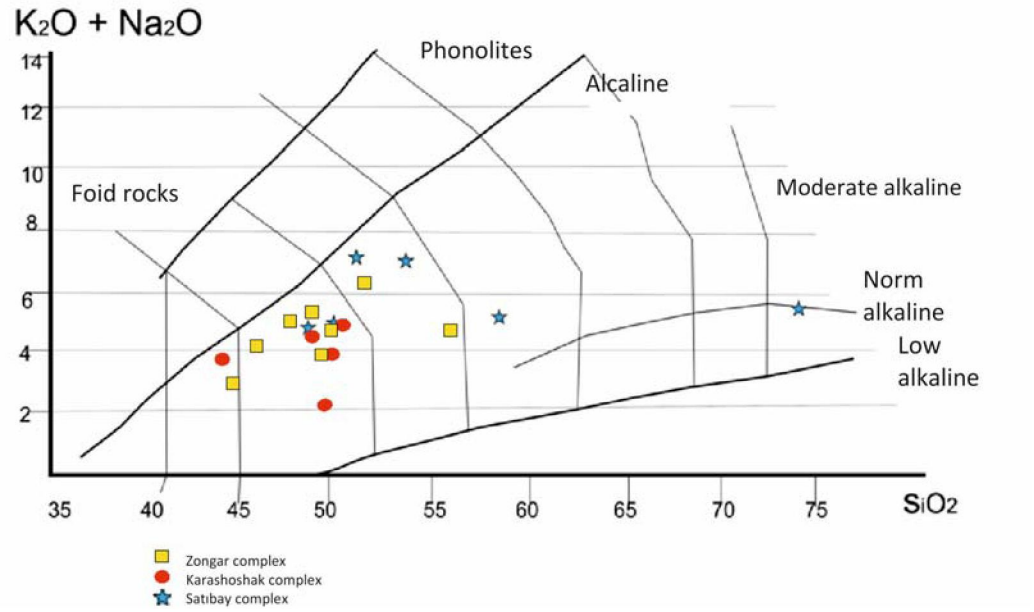


Figure 5 – Position of rocks of Zongar, Satybai and Karashoshak complexes on the alkali-silica diagram

Sm-Nd isotopic analysis of magmatic and metamorphic complexes. In the Sm-Nd [16] system, two isotopes ^{143}Nd and ^{144}Nd and, more usually their ratio $^{143}Nd/^{144}Nd$, determine the age information, high value indicates significant contribution of the mantle to the source, and a low value indicates high contribution of the crust to the source. On the basis of this pair, as well as with the participation of another

pair of $^{87}Sr/^{86}Sr$ isotopes, many geochemical and geodynamic diagrams were constructed showing the evolution of the planet Earth [12].

From a set of geological samples of past years and from the outcropping of the ophiolite belts, a batch of 14 samples was formed to carry out an isotopic analysis, which was sent to the VSEGEI Isotope Center [13].

Results of Sm-Nd isotope-geochronological analysis of Tekturmas and Itmurundy samples.
The sampling sites are shown in figure 2

	Sample	Sm(ppm)	Nd(ppm)	$^{147}Sm/^{144}Nd$	$^{143}Nd/^{144}Nd$	Age	$\varepsilon_{Nd}(0)$	$\varepsilon_{Nd}(t)$	t_{DM}	t_{DM2}
1	171	0.151	0.400	0.2279	0.512920±25	495 Ma	5.5	3.5	-2490	946
2	172	0.342	0.725	0.2855	0.513322±20	495 Ma	13.3	7.7	363	596
3	182	0.597	2.369	0.1524	0.512710±13	480 Ma	1.4	4.1	1098	884
4	183	1.621	6.674	0.1468	0.512635±12	480 Ma	-0.1	3.0	1177	977
5	184	0.701	1.746	0.2427	0.513072±13	490 Ma	8.5	5.6	-416	770
6	185	1.509	6.243	0.1462	0.512683±10	480 Ma	0.9	4.0	1058	896
7	186	1.086	4.054	0.1619	0.512559±16	480 Ma	-1.5	0.6	1741	1178
8	187	1.976	8.153	0.1465	0.512650±7	480 Ma	0.2	3.3	1137	952
9	T-6	11.18	54.57	0.1239	0.512710±8	480 Ma	1.4	5.9	750	739
10	T-12	3.462	11.29	0.1855	0.512996±8	480 Ma	7.0	7.7	841	588
11	T-5	2.896	9.550	0.1834	0.512984±15	480 Ma	6.7	7.6	843	597
12	T-4	12.95	93.74	0.0835	0.512500±6	480 Ma	-2.7	4.3	763	874
13	B-10	5.148	15.91	0.1957	0.513022±6	490 Ma	7.5	7.6	1098	606
14	B-12	4.319	14.99	0.1742	0.512952±4	490 Ma	6.1	7.5	770	608

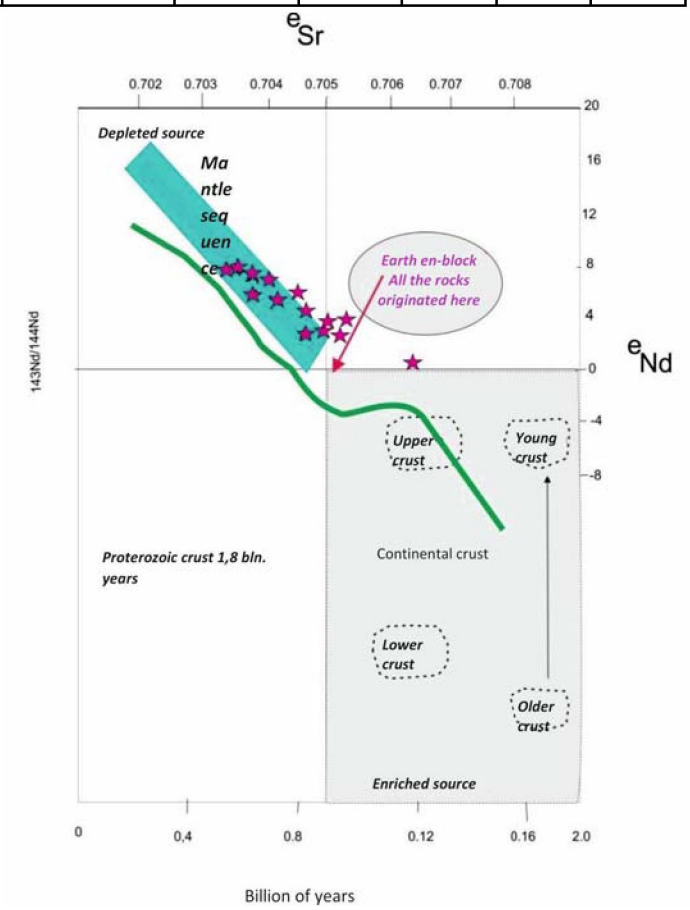
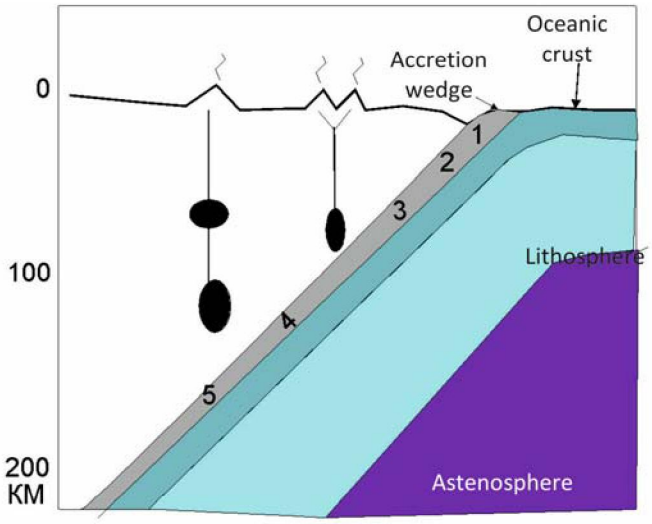


Figure 6 –
Isotopic correlation diagram
of the comparative positions
of depleted and enriched mantle
sources according to [13].
Samples of igneous rocks
from Tekturmas (red stars)
and a curve were obtained
from 9 porphyry copper deposits
in Central Kazakhstan with the addition
of 3 fields of NW Xingjiang (green line [12])

In the diagram in figure 6, the upper left square demonstrates the isotopic composition of the parental restite, and the turquoise rectangle in it shows the change in composition during subsequent partial meltings, that is, the mantle succession without the intervention of the upper shells. The green line reflects the composition of the magmas of nine porphyry copper deposits in Central Kazakhstan, demonstrating a consistent dilution of the restite with the upper crust material, either during the rise of the mantle magmas to the Earth's surface, or in the form of dilution directly in the mantle by the subduing upper crust material. From the diagram, it follows that the magmas involved in the TOB (red stars) are not promising with respect to porphyry copper metallogenesis and, conversely, promising with respect to liquation copper-nickel deposits genetically associated with a relatively pure mantle source.

The igneous complexes of the Tekturmas axial zone and the Arkars site in Itmurundy melange were formed as a result of partial remelting of depleted magmatic sources, which are united here under the common title "EARTH MANTLE". As it was shown [14], a detailed study of the ore-magmatic provinces (New Britain, the Aleutian Islands, Japan, the Banda arc, Peru, etc.), productive for copper-porphyry mineralization magmas are those that have mixed in different proportions from three sources : mantle + lower crust (gray gneisses and anorthosites) + upper crust (granites). Our rock specimens from the central zone of Tekturmas and Itmurundy showed no signs of magmatic mixing. From this it follows that the detection of copper-porphyry type ore deposits in them is problematic. The green curve line built by the points from Central Kazakhstan and western Xinjiang belongs to a number of mixed magmatic sources: the mantle and crust with values ^{e}Nd = ***0-(-6)***, indicating a significant contribution of the crust to the primary maternal magmas, whose primary origin is indicated by the upper the left side of the green curve, in the magmas of which eNd=0+(12).

Conclusion. Materials justifying pertainance of Tekturmas belt to groups of fault wandering and shallow melanges formed by the exhumation mechanism scheme [14] in the mode of reverse (counter towards sinking of the mantle Itmurundy melange) pressing of Itmurundy melange fragment by ultra high pressure from the depth of the upper crust. Such a model is proved by the absence of the oceanic setting in Silur and the absence of its own (Tekturmas) volcanic belt on the supra-subduction plate, which are considered guiding geological features in defining classical subduction; the absence of inclusions of high and ultrahigh pressure rocks such as eclogites, blue slashes and various garnet amphibolites (present in Chara melange), as well as jadeite, garnet amphibolites and blue shales (Itmurundy melange) in Tekturmas melange; the emergence of blue shale in classical subductions occurs in sector 2 (figure 7) at a depth of 50-60 km at a temperature of about 500° [14].



Sectorial type of typical subduction zone in depth:
1 - green shist; 2 - blueshist and intensive dewatering;
3 - eclogite and partial melting; 4 - complete melting;
5 - restite

Figure 7 – Sectorial typeof typical subduction zone in depth [14]

The absence of blue shales in Tekturmas indicates that the intersection of the Tekturmas fault with the Itmurundy melange and the start of the own Tekturmas melange to the surface took place no deeper than the middle of the lower crust, i.e., above the Mohorovichich line. The lower crust itself is incapable of generating either magma chambers or porphyry copper deposits without affecting the mantle heat-mass transfer. These theoretical assumptions show that it is not promising to search for porphyry copper deposits due to subduction.

The final results of the Sm-Nd isotope analysis are shown in table 2 and in figure 6. All samples of the basic igneous rocks indicated a single source – the depleted mantle, i.e. that part of the mantle, which, even at the earliest meltings 1.8 and 2.4 billion years ago, through out from itself a low-temperature and low-melting fraction, on the basis of which the Archean and Proterozoic shells were decorated, which collected rare metals, polymetals, barite, manganese and other metals with large ionic radii. Heavy metals remained in the remainder of the melts in the reste: copper, nickel, cobalt, platinum, palladium, iridium, osmium, radonium, and many others. This mantle occupies the upper left square and when melted fractionates with formation at the end of the continental tholeite, which is the basis for two series of mixing: mixing with the upper crust, it gives a rare metal granitoid series, and mixing with the lower crust, it gives a calc-alkaline series, which fall into and adakites [15] are the main petrological formation of porphyry copper metallogenesis (figure 8 [12, 13]). The position of the main Kazakhstan porphyry copper deposits KONYRAT and SAYAK is shown in fig. 8 green star. It demonstrates the high contribution of the mantle in the igneous rocks of the deposits.

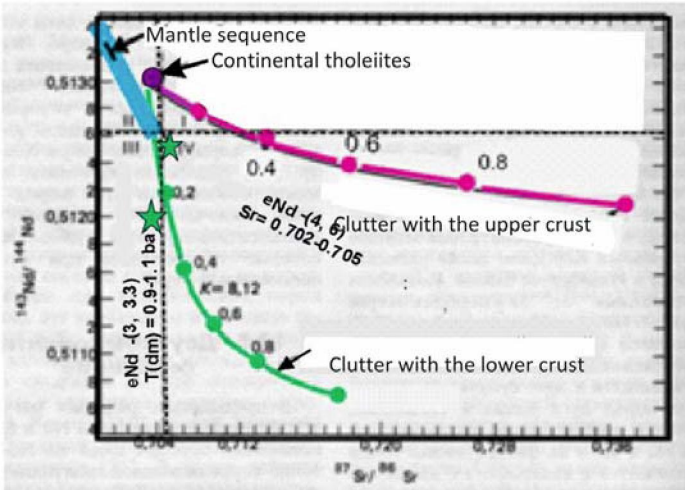


Figure 8 – Curves of the crustal components in clutter of mantle magmas with granulite (lower) and granitoid (upper) shells of the Earth

The depleted mantle itself, without mixing with anything, produces during melting high-temperature basalts, prone to segregation and the formation of copper-nickel-platinum-palladium-osmium-iridium and other deposits. From the correlation diagram in figure 8 it is seen that all samples of the basites and related trachytes and trachytoids were grouped around the mantle sequence line. Isotopic analysis showed that the region was not prospective for copper-porphyry metallogenesis, but for copper-nickel metallogenesis with the participation of precious metals.

Note. It is not recommended to use dilution curves for practical purposes, for the simple reason that, when moving to the upper shells, they communicate with different breeds, each of which enriches the toleiites with its components. The position of the real rock on the curves can be estimated only with the balance of the isotopes of strontium and neodymium in the samples of this rock and equation (9.22) in [12] on page 243.

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ТЕКТҰРМАС ОФИОЛИТТІ БЕЛДЕУІНІҢ ГЕОДИНАМИКАСЫ МЕН МЕТАЛЛОГЕНИЯСЫ
(ҚР Ғылым қорының 2018-2020 грант материалдарынан "Тектұрмас офиолит белдеуіндегі минералдану учаскелерін тереңдік болжау, іздестіру, барлау)

Аннотация. Құрылымдық, петрохимиялық және изотоптық-геохнологиялық (Sm-Nd) әдістер негізінде терең жыныстардың абсолюттік жасын анықтау орындалды. Тектұрмас офиолит белдеуі дамуының геодинамикалық моделі құрылған,ол тектоникалық аймаққа енгізілген жарықсыз Меланж түрінде қалыптасқан.

Авторлардың ұсыныстарына сәйкес, Тектұрмас офиолиттік белдеу Қазақстан құрлығына Мұхит плитасының субдукциясы нәтижесінде пайда болған классикалық белдеу, ал алдын ала болған тектоникалық әлсіреген аймаққа енгізілген Итмұрынды меланж бөлігі ретінде жарқылсыз меланжем болып табылмайды.

Итмұрынды және Тектурмас офиолиттік меланждардың өте көп ортақтығы бар. Тектұрмас және Итмұрынды белдеулерінің жақын арадағы көршілес болуы және олардың табиғи кешендерінің ұқсастығы Тектұрмас официолит белдеуі Итмұрынды офиолит белдеуінің қатысуымен құрылғандығының салдары болуы мүмкін.

Тектұрмас официолит белдеуінің құрылысы туралы жаңа деректер келтірілген, ол Орталық Қазақстанның осы бөлігінде оның пайда болу моделін қысқаша тұжырымдауға мүмкіндік береді.

Sm-Nd изотоптық талдауд нәтижелерінің деректері бойынша негізгі магмалық жыныстардың барлық үлгілері бірыңғай дерек көзі – деплеттелген мантия, яғни ең ерте балқымаларда төмен температуралы және жеңіл балқитын фракцияны бөліп көрсеткен, олардың негізінде сирек металдар, полиметаллдар, барит, марганец және үлкен ионды радиусы бар басқа да металдар жиналған Архей және Протерозой қабықтары ресімделген.

Изотоптық талдау өңірдің мыс-порфир металлогенезіне емес, бағалы металдар қатысуымен мысникельді металлогенез перспективалылығын көрсетті.

Түйін сөздер: Тектұрмас офиолитті белдеуі, Итмұрынды меланжы, геодинамика, субдукция, эксгумация, вулканды белдеу, изотопты-геохронологиялық (Sm-Nd) зерттеулер, мыс-порфирлі, мыс-колчеданды кенорындар.

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ГЕОДИНАМИКА И МЕТАЛЛОГЕНИЯ ТЕКТУРМАССКОГО ОФИОЛИТОВОГО ПОЯСА
(По материалам гранта Фонда науки РК 2018-2020 «Глубинный прогноз, поиски, разведка участков минерализации в Тектурмасском офиолитовом поясе)

Аннотация. На основе структурных, петрохимических и изотопно-геохронологических (Sm-Nd) методов выполнено определение абсолютного возраста глубинных пород. Создана геодинамическая модель развития Тектурмасского офиолитового пояса, предусматривающего его формированием в виде трещинного безкорневого меланжа, внедренного в тектоническую зону.

В соответствии с представлениями авторов, Тектурмасский офиолитовый пояс не является классическим поясом, возникшим в результате субдукции океанической плиты под казахстанский континент, а трещинным бескорневым меланжем, как части итмурундинского меланжа, внедренного в предварительно существовавшую тектоническую ослабленную зону.

Тектурмасский офиолитовый меланж имеет очень много общего с Итмурундинским. Ближайшее соседство Тектурмасского и Итмурундинского поясов и сходство их породных комплексов может быть следствием того, что Тектурмасский офиолитовый пояс образован при участии Итмурундинского офиолитового пояса.

Приведены новые данные о строении Тектурмасского офиолитового пояса, позволяющие кратко сформулировать модель его появления в этой части Центрального Казахстана.

По данным результатов Sm-Nd изотопного анализа выяснилось, что все образцы основных магматических пород показали единый источник – деплетированная мантия, т.е. та часть мантии, которая еще на самых ранних плавках выделила из себя низкотемпературную и легкоплавкную фракцию на основе которых были оформлены Архейская и Протерозойская оболочки, которые собрали в себе редкие металлы, полиметаллы, барит, марганец и другие металлы с большими ионными радиусами.

Изотопный анализ показал перспективность региона не на медно-порфировый металлогенез, а на медно-никелевый металлогенез с участием драгметаллов.

Ключевые слова: Тектурмасский офиолитовый пояс, Итмурундинский меланж, геодинамика, субдукция, эксгумация, вулканический пояс, изотопно-геохронологические (Sm-Nd) исследования, медно-порфировые, медно-колчеданные месторождения.

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