Chapter 3 Geology and mineralization in Terektinsky Uplift Area

3-1 Regional geological setting

In present day Central Kazakhstan, the Precambrian massifs, Paleozoic fold belts and related granitic plutons form an arch, convex to the northwest, with rock ages decreasing to the southeast (Figure I-3-1-1).

In the Paleozoic rocks, five fold systems have been identified which are interpreted to be the result of the progressive subduction of Cambrian oceanic crust beneath Precambrian massifs, commencing in the Late Ordovician and continuing, with various relocations of the subduction zone, up to the Late Carboniferous (Glukhan and Serykh, 1996). Initially, the subduction occurred along the Turkestan Sea which was considered to be located in the east to northeast part of the Central Kazakfstan. The Hercynian orogenies, (which involved continental collision that joined Europe and Asia), extended from the Middle Carboniferous into the Triassic, and are interpreted to have resulted in a N-S directed compression of the region. In fold belts are believed to have formed linear zones, but later underwent bending and lateral displacement along major strike-slip shear zones. The Terektinsky uplift area lies at a major bend in the Caledonian fold belt (Fig I-3-1-1).

The Hercynian orogenies, (which involved continental collision that joined Europe and Asia), extended from the Middle Carboniferous into the Triassic, and are interpreted to have resulted in a NNE-SSW directed compression of the region. This compressional tectonic regime produced strike-slip faults, strike-slip shear zones with thrust motion, and the Sarysu-Teniz zone of block-faulting, with dextral displacement along northwest trending faults and sinistral displacement along northeast and east-west trending faults (Khain, 1985).

The Terektinsky Uplift area is located within the Sarysu-Teniz Block Fault sytem which lies between the Late Paleozoic Teniz and Zhezkazgan basins (Fig I-3-1-1). The Sarysu-Teniz zone consists of alternating, relatively long but narrow, horst-anticlines and graben-synclines trending northwest, cut by closely spaced sub-parallel reverse faults trending approximately east-west (Khain, 1985). The cores of the horst-anticlines contain Precambrian and Early Paleozoic basement while the graben-synclines consist generally of

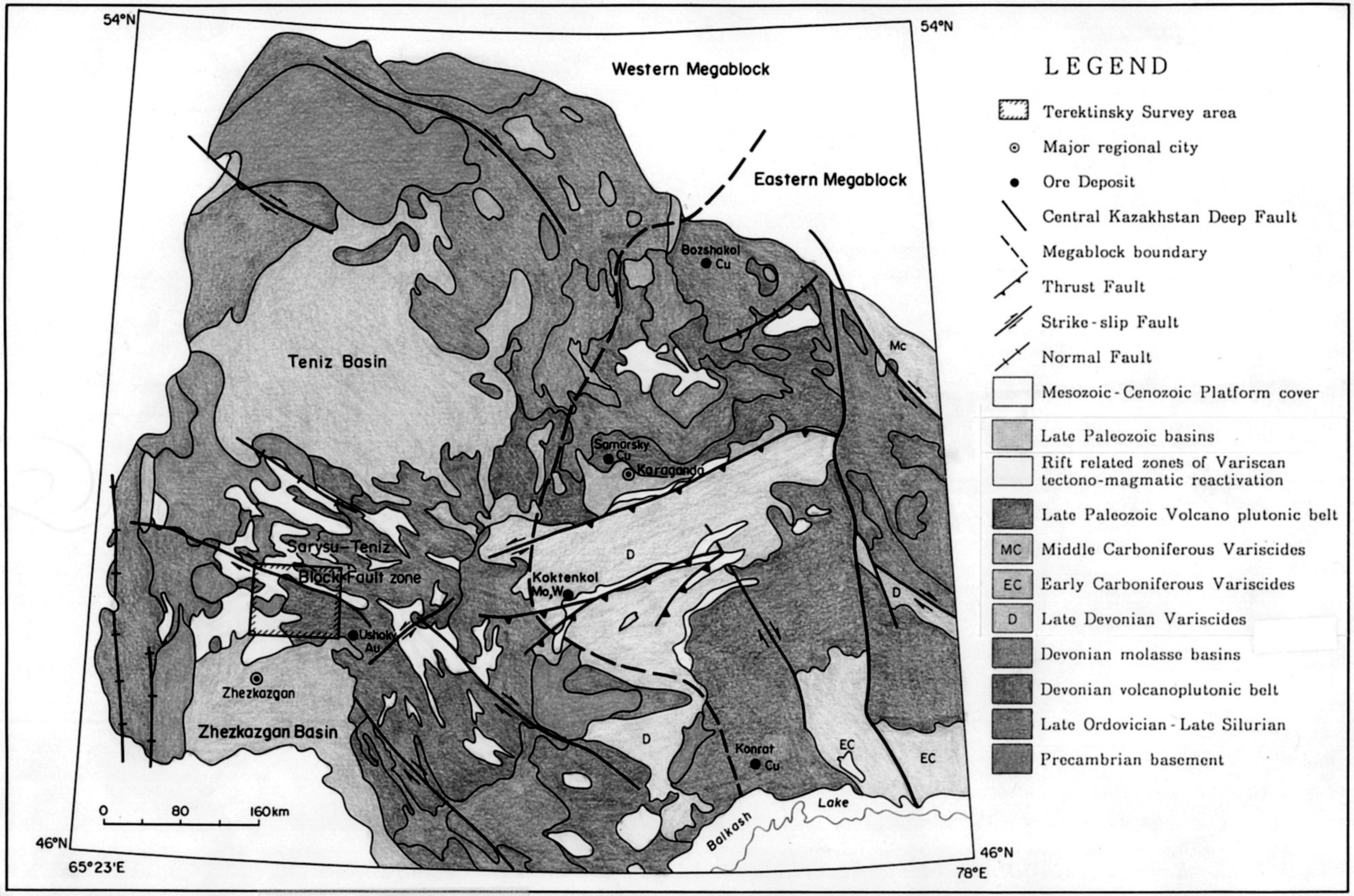


Figure I-3-1-1 Geological Map of Central Kazakhstan
(modified after Orlov, Kondrashenkov, Shchebunyaev, in Glukhan and Serykh, 1996)

tightly folded Upper Devonian carbonates. Lower-Middle Devonian volcanic molasse separate the basement from the Upper Devonian rocks.

3-2 Metallogeny of the Central Kazakhstan

A general outline of the mineral resources of Central Kazakhstan, including a description of metallogenic zones, metallogenic epochs, and deposit types, is presented in Malchenko and Ermolov (1996). The Terektinsky Uplift area lies in the Koktas-Sonaly metallogenic zone which contains Late Caledonian epoch tungsten, tin, molybdenum, copper, and gold mineralization hosted by Devonian volcanoplutonic rocks. The known tungsten, tin and molybdenum mineral occurrences are small and of sub-economic grade (by previous Soviet standards), and are therefore not considered an attractive exploration target. The Koktas-Sonaly metallogenic zone is believed to have a greater potential for economic copper-molybdenum and gold mineralization as, over the last decade, porphyry copper-molybdenum-gold, and quartz vein gold deposits have been found elsewhere in Central Kazakhstan's Devonian volcanoplutonic rocks

The main styles of mineralization noted in Central Kazakhstan's Devonian volcanoplutonic rocks are:

1. Samarsky type, copper (Cu)-gold porphyry style mineralization related to the contact between volcanogenic sedimentary rocks and Middle Devonian porphyritic granitic intrusions
2. Ushoky type, vein style, quartz-sulphide-gold (Au) mineralization hosted by Lower Devonian volcanic rocks, with a possible association to Upper Devonian granitic intrusives
3. Granite related, quartz-cassiterite, cassiterite-tourmaline, and cassiterite-sulphide, tin (Sn) mineralization, and
4. Granite related, tungsten (W) and molybdenum (Mo) occurrences

3-3 Geology of the Terektinsky Uplift Area

3-3-1 Geologic Setting

The Terektinsky Uplift area is located within the Late Paleozoic Sarysu-Teniz Block Fault sytem which consists of alternating, long but narrow, horst-anticlines and graben-synclines trending northwest, cut by closely spaced sub-parallel reverse faults trending approximately east-west (Khain, 1985). In the Terektinsky survey area, the cores of the horst-anticlines contain Precambrian and Early Paleozoic basement, while the graben-synclines consist generally of folded Upper Devonian and Lower Carboniferous carbonates and shallow marine sediments. Igneous rocks, which intruded Early Paleozoic basement during the Ordovician and Lower to Middle Devonian, are exposed in the horst-anticlines. The igneous rocks primarily belong to the Devonian volcanoplutonic belt which formed during the Caledonian orogenic phase in Central Kazakhstan.

3-3-2 Stratigraphy

The stratigraphy of the survey area consists of Proterozoic basement, Ordovician volcanics and sediments, Lower to Middle Devonian volcanics, pyroclastics and interbedded sediments, Upper Devonian and Lower Carboniferous carbonates and sediments, and unconsolidated Quaternary alluvial and lacustrine sediments. A schematic columnar section of the stratigraphy in the survey area is presented in Figure I-3-3-1 and Figure I-4-1-1 present a geological map and geological cross sections of the survey area. The detailed description of each formation was shown in Fhase II report.

3-3-3 Intrusive rock

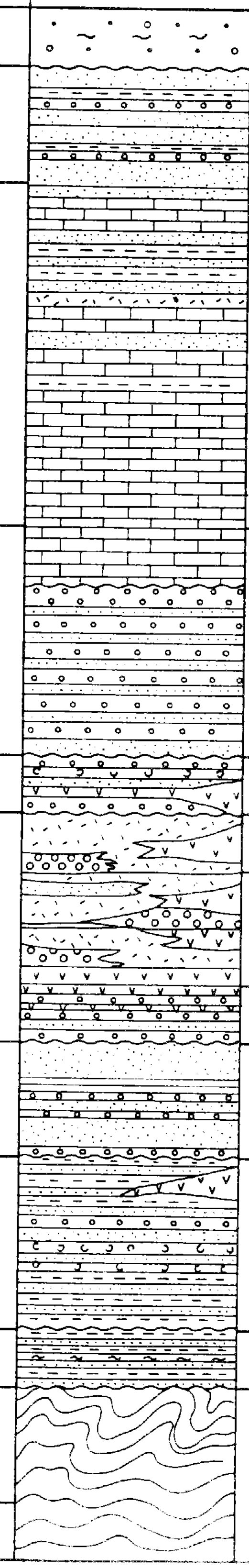
Intrusive lithologies comprise approximately 25% of the survey area. They occur in the centre and east of the area as massifs and plutons in anticlinal structures and up faulted blocks. Three intrusive phases, with rock types varying from gabbro to aklaine-granite, have been defined based on stratigraphic relationships and previous K-Ar dating.

The oldest intrusive phase is believed to be a gabbroic pluton of the Middle Ordovician Kurtukul (or Qurtukul) Intrusive Complex. All other phases belong to either the Lower Devonian to Carboniferous Karamendin Intrusive Complex or Middle-Upper Devonian Terektin Intrusive Complex.

The Karamendin Complex is important in connection with the mineralization. The current shape of Karamendin Complex bodies in the area relates to late Paleozoic tectonomagmatic reactivation and uplift, which imposed northwest and east-west

Geologic Age			Symbol	Russian Formation Symbol	Thickness (m)	Lithology	Tectonic Event
Cenozoic	Quarternary		QI-QIII	Q	1-10	Undifferentiated clay, sand, gravel and loam	Stable platform
Paleozoic	Carbon-ferous	Upper-Middle	C	C2-3dz	365-630	Postorogenic marine terrigenous and carbonate sequence: limestone, sandstone, siltstone and conglomerate	Basin and trough formation by tectono-magmatic reactivation
				C2ts			
		Lower		C1Bt	150-250		
				C1dt			
				C1jag			
				C1is			
				C1rg	100-250		
				C1ks			
	Devonian	Upper	D3	D3slsm	200-500		
				D3ut	200-1200		
				D3zd	800-1000		
				D3dz	1000		
		Middle	D2	D2tl	2400	Synorogenic intermontane basin sequence: conglomerate, sandstone, rhyolite, rhyodacite, andesite-basalt tuff and lava	Subduction
		Lower	D1a	D1uz	900		
			D1b	D1zt	600		
				D1tz	1125		
			D1c	D1ut	930-1550		
	Ordovician	Upper	O3	O3	1800	Geosynclinal marine sedimentary sequence: sandstone, siltstone, conglomerate tuff and andesite-basalt lava	Rifting
				O3krb			
		Middle	O2	O2al	1500		
				O2sv	600		
				O2kt	600		
		Lower		O1-2ks	500		
Proterozoic	Riphean	Middle-Lower	PR	Ri-2		Quartz-sericite and quartz-chlorite schist and porphyrite	Metamor-phism
	Lower Proterozoic			PR1			

Columnar Section:



Igneous Activity / Mineralization:

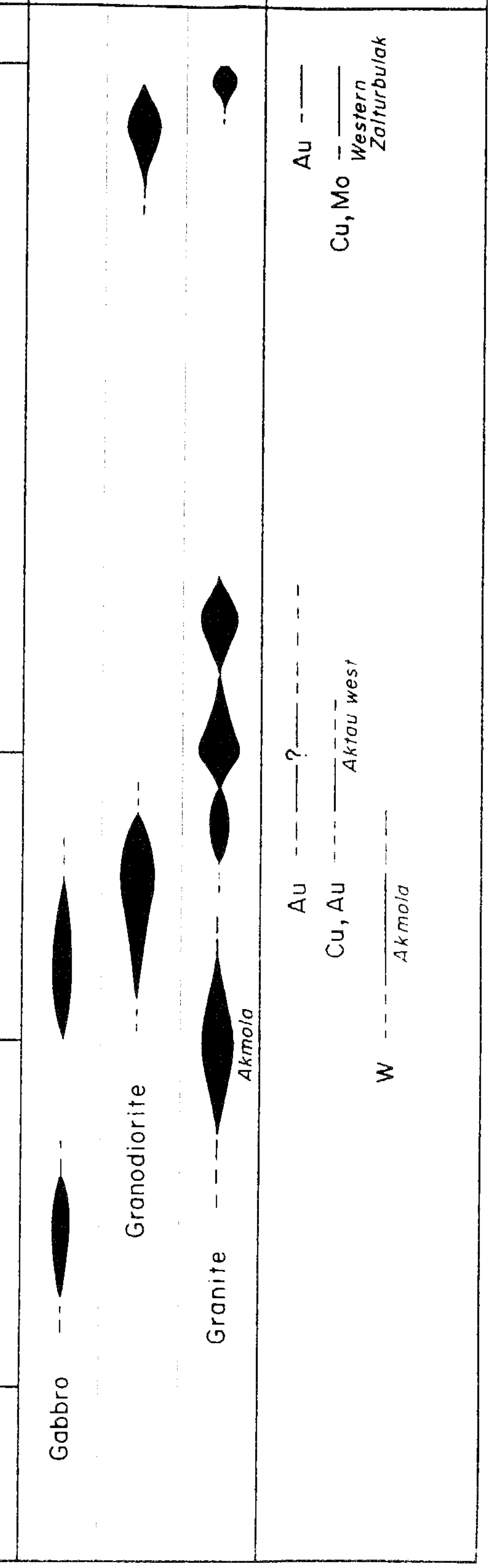


Figure I-3-3-1 Columnar Section of Terektinsky Uplift Area trending fault boundaries on many of the rock units in the area. The main rock facies of the Karamendin Complex consists of granodiorite to granite. According to the Isotope age, the activity of the Karamendin Complex varies from middle Caledonian to Variscan in age (Figure I-3-3-5).

3-3-4 geological structure and mineralization

Many occurrences of gold, base and other metals exist in the area (TableI-3-3-1, TableI-3-3-2 and FigureI-3-3-2) These occurrences are considered to have formed in relation to remobiled Caledonian orogeny during middle to late Paleozoic, and in many cases, they are also associated with Devonian granitic plutons.

In this section, the relationship between geological structure and mineralization zone is described.

The trend of mineralization in this area have a dominant NNE-SSE～NS direction (upper left in Figure I-3-3-4). In Zalturbulak area, the majority of mineralized veins run in the N-S or NNW-SSE direction. The diorite porphyry intrusions, which are implied to have brought about the mineralization of the Central Zalturbulak Zone, indicate similar trends. Based on this fact, it was considered that the regional compression stress might well have formed numerous open fissures of the N-S and NNW-SSE directions, which played a role of channels for ascending magmas and hydrothermal solutions(Ref, PART II,Chapter 4).

In Kuzulutas, two dominant directions of fractures are recognized, namely NNW-SSE and WNW-ESE directions (lower right in Figure I-3-3-4). The NNW-SSE fractures lining up echelon and forming right-stepping fracture system (JICA/MMAJ,1998:P103) are left -lateral strike-slip faults. Therefore, two trending fractures are considered to be conjugate faults forming in the NW-SE compression field.

Most mineralization zone of the Terektinsky uplift area is estimated to form to be affected by either open fissures or left-lateral strike-slip faults. Either way, the compression field from southeastern direction basically controlled the mineralization zone.

On the other hand, there are many indications of ENE-WSW compression in northern to northwestern part of Terektinsky uplift area such as the direction of intrusive bodies of Akmola area, dyke swarm in western part of Zalturbulak and general trend of Shubarkol prospect. In general, the relative older rocks are distributed in the northwestern part of the Terektinsky uplift area, and before getting ENE-WSW compression these older rocks were considered to be suffered from ENE-WSW compression.

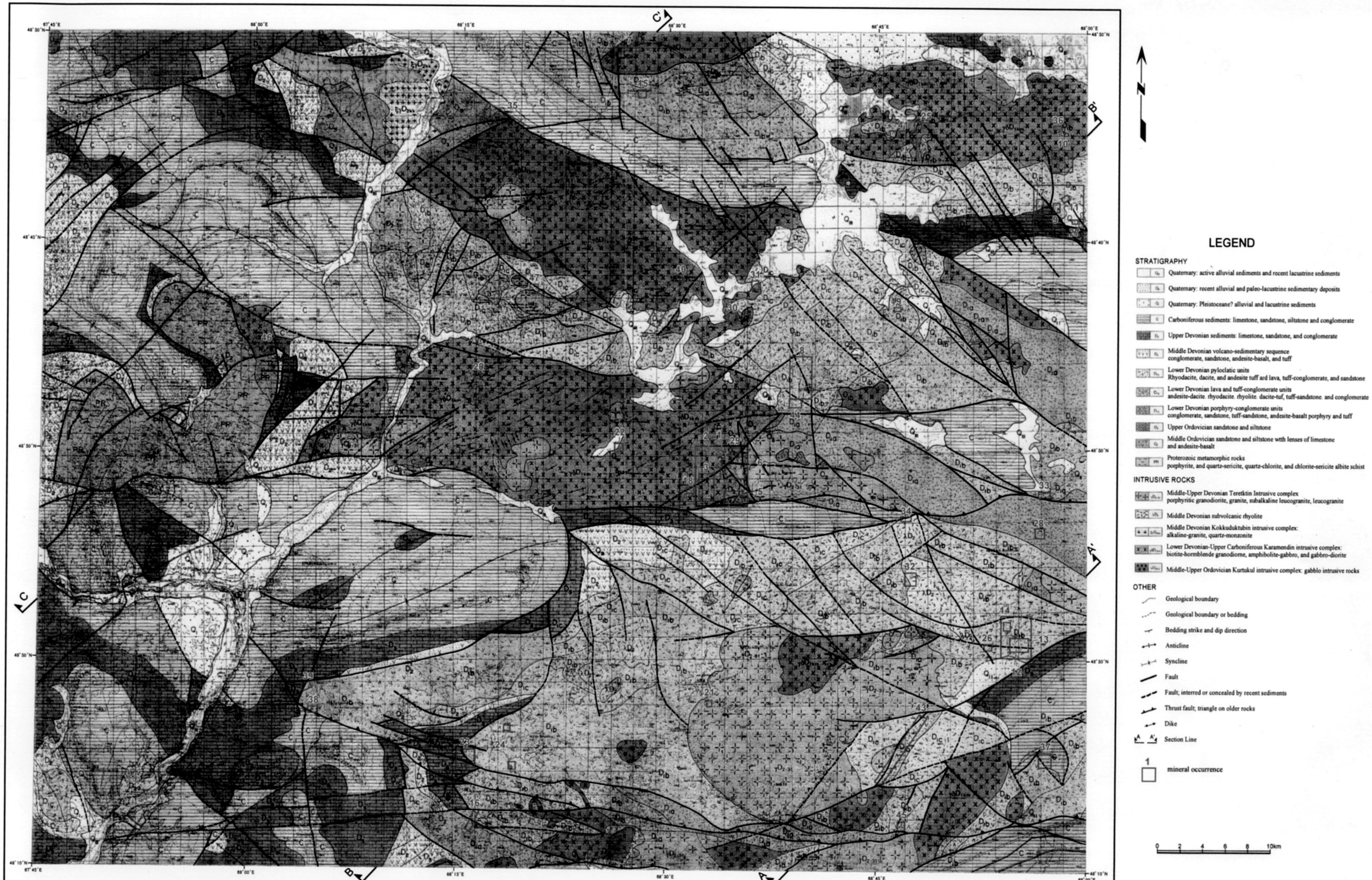


Figure Ⅰ-3-3-2 Geology and Mineral Occurrence Location Map, Terektinsky Uplift Area

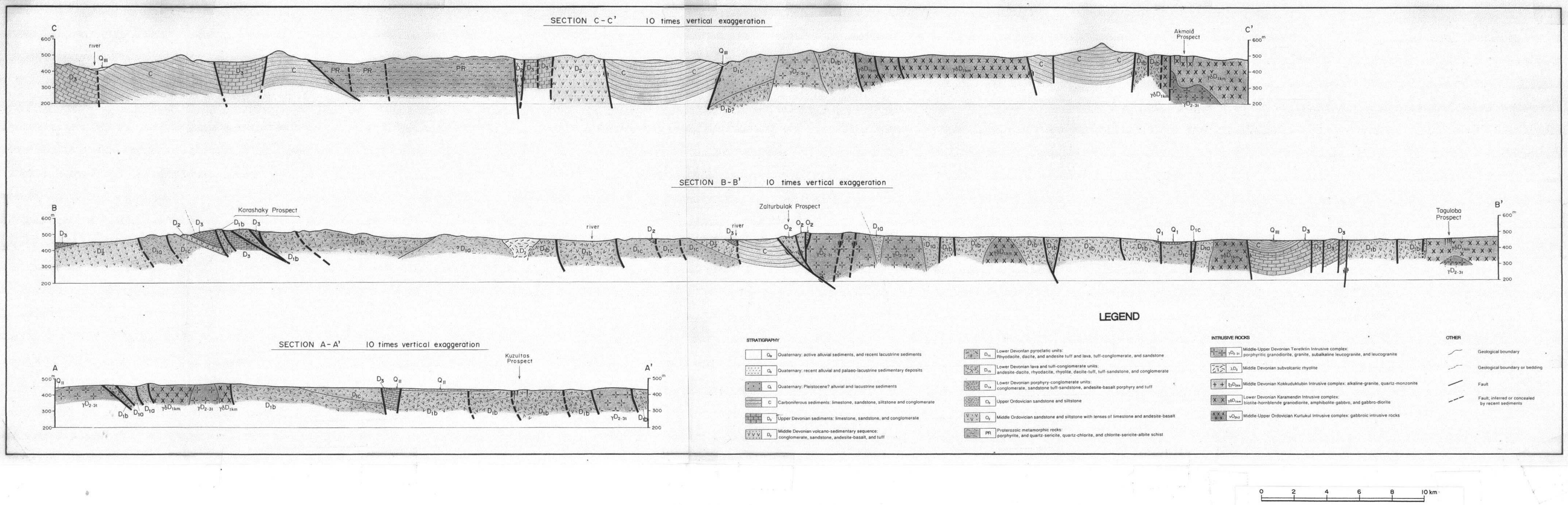


Figure I-3-3-3 Geological Cross Section of the Terektinsky Uplift Area

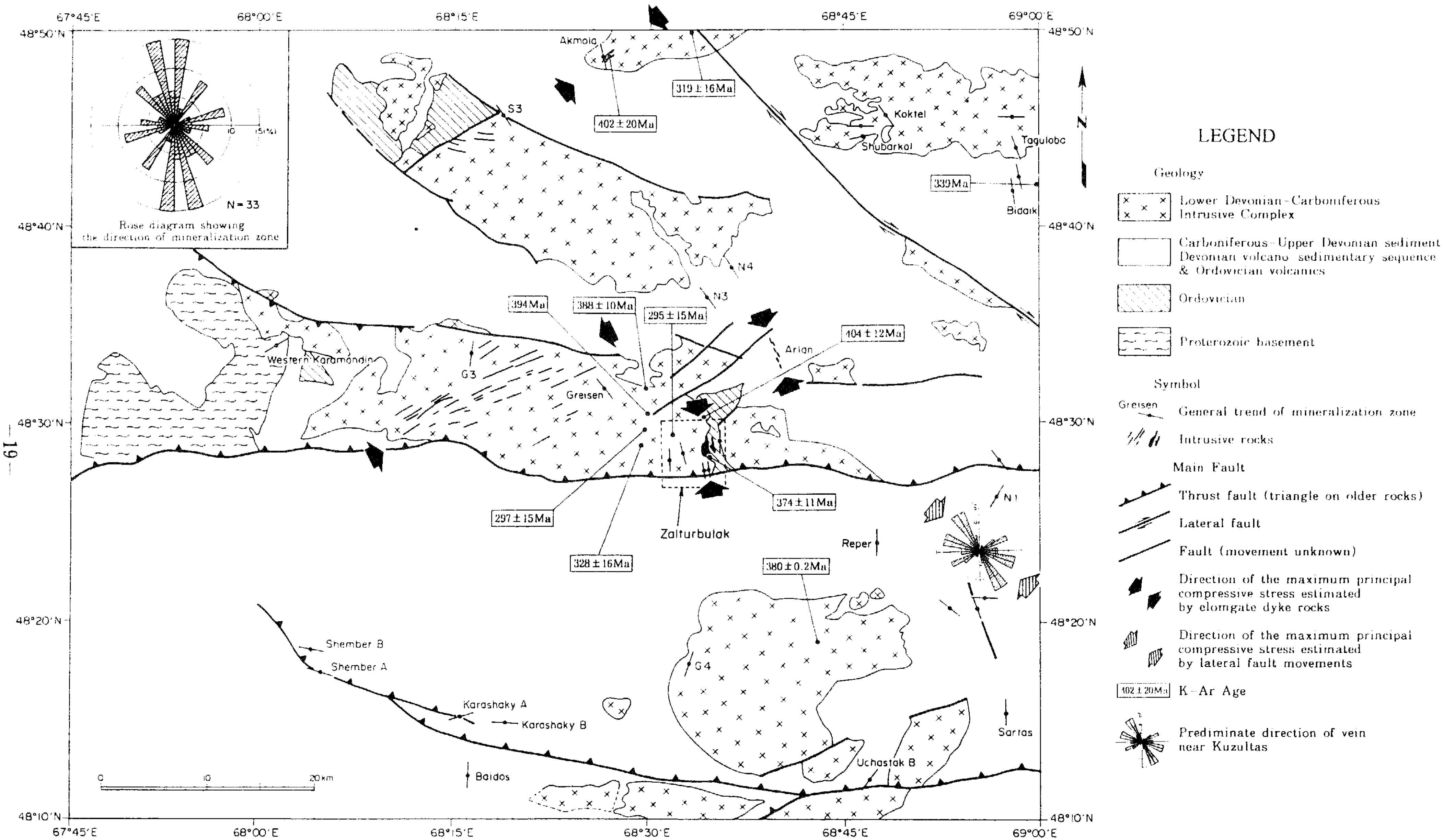
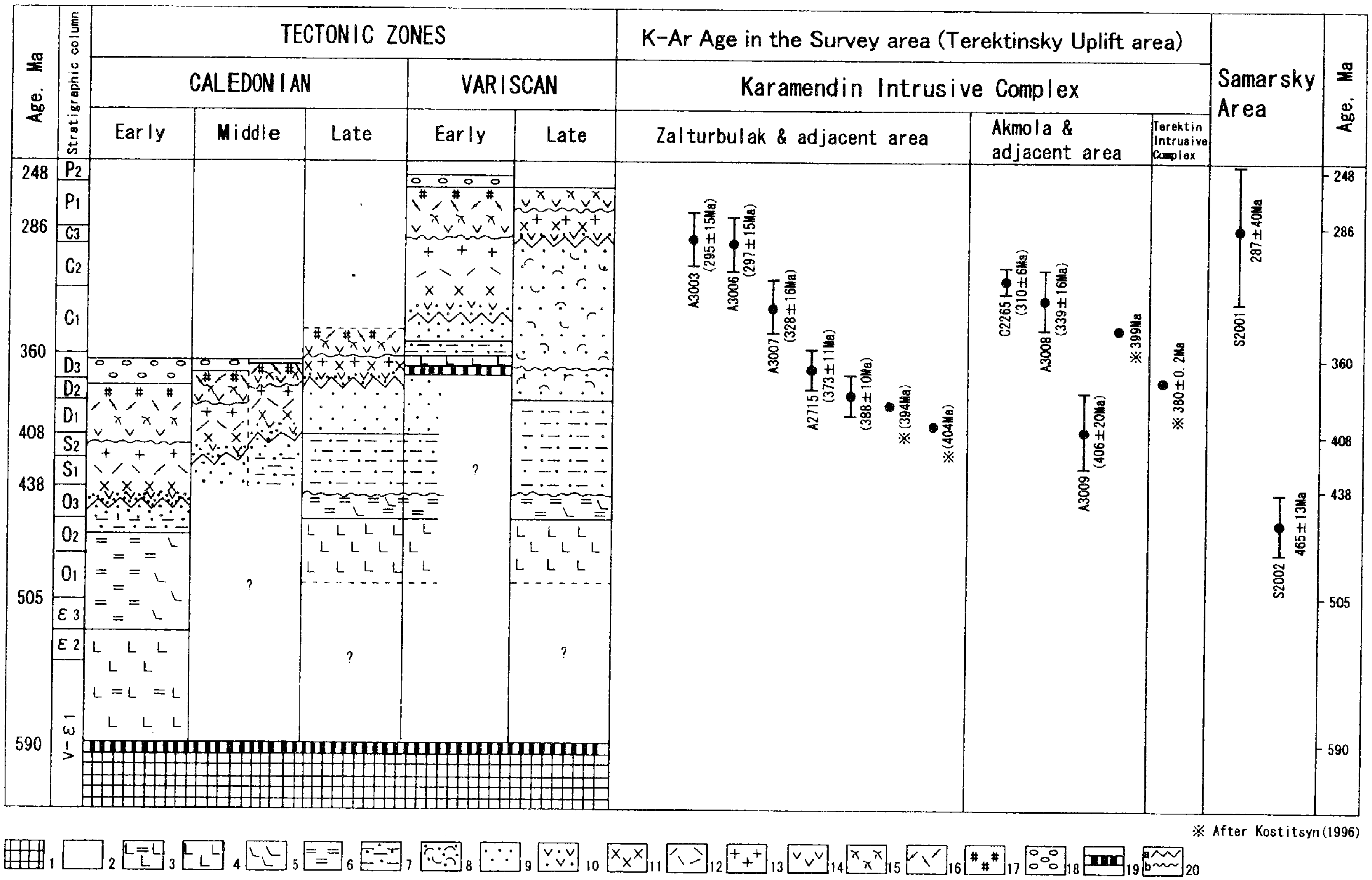


Figure I-3-3-4 Geotectonic map and results of age dating in Terektinsky Uplift Area



1- Precambrian basement; 2- platform sedimentary cover; 3~18- Paleozoic rock associations: 3- cherty-basalt, 4- trachybasalt, 5- andesitic basalt, 6- jasper, 7- flysch, 8- tuffaceous-terrigenous, 9- terrigenous variegated (in early Caledonides with olistostromes), 10- island arc andesite-rhyodacite, 11- tonalite-granodiorite, 12- rhyolite (subaerial), 13- leucogranite, 14- trachyandesite-trachyrhyodacite (subaerial), 15- granosyenite, 16- subalkaline rhyolite, 17- alaskite, 18- continental red molasse, 19- continental breakup events; 20- main folding events and corresponding unconformities: a- main, b- secondary.

Figure I -3-3-5 Age of the Igneous Rock

Table I-3-3-1: Summary of mineral occurrence and their characteristics in the Terektinsky Uplift Area (Regional survey area)

No.	Mineral Occurrence Name	Latitude N	Longitude E	Host rock	Mineralization zone	Fault System Orientation	Mineralogy: Alteration Intensity	Mineralogy: Visual	Mineralogy: X-ray Diffraction	Inclusion Homogen. Temp. (°C)	Metal Grade (ppm): No.	Au	Ag	Cu	Pb	Zn	other	Ore Minerals (Polished Section)	Mineralization Type	Size of Alteration zone · Mineralization zone	Previous Prospectings
15	Akmola Southeast (Zabutaia)	48°47'07"	68°27'56"	altered Devonian sediment and f. gd. Granite	Intense alt zone	?	S	Qz-Ser-Clay	Qz-Ser-Kao		3	<0.01	<0.2	5.5	12	3.4	Ba:429		2b?	50 m × 50 m (Alteration zone)	
16	Baidos	48°12'38"	68°16'08"	granite porphyry	silicified zone	NS	S	Qz-Ser-Clay-Hem	Qz-Prp-Dia-Py±		4	<0.01	<0.2	39.8	11	2	Ba:697	Cp, Py, Po	2b	700 m × 50 m (Silicified zone)	
17	Demdi	48°41'52"	68°56'41"	Devonain sediment, volcanics	qz floats zone	?	?	?			4	<0.01	0.4	54	59	33.3	Ba:1150	Cp, Py, Po	7		Drilling Hole : 1 site
18	G1	48°28'	68°31'	granodiorite (Karamendin)	qz vein zone	N5W	W	Qz	Qz-Pl-Or-Hor-Chl		2	<0.01	<0.2	9.3	3	2.2			2b	20 m × 4 m (Quartz vein)	
19	G2	48°37'	68°46'	Lower Devonian	qz vein-qz network		W	Qz-Hem	Qz-Pl		2	0.08	0.3	89.5	11	3.7	Ba:1330	Cp, Py, Ht, Lm	2a	Many quartz boulder zone in 2km×2km area	Trench : 1 line
20	G3	48°34'	68°16'	granodiorite (Karamendin)	5 qz veins	N10E	W	Qz-Clay	Qz-Or-Pl-Chl±Ser	158-338	2	<0.01	<0.2	20.5	5	<0.5			2b	10 m × 3 m (Average of Quartz vein)	Trench : 3 lines
21	G4	48°18'	68°33'	Bt granite (Terektin)	qz network-qz floats zone	N20E	W	Qz	Qz-Pl-Or-Bi	259-419	5	<0.01	<0.2	17.2	6	2.7			2b	117 m × 3 m (Quartz boulder zone)	
22	Greisen	48°32'	68°27'	granodiorite (Karamendin)	qz floats zone	N45W	W	Qz		229-366	2	<0.01	<0.2	17.7	<2	<0.5			2b	50m×20m, 10m×15m (Quartz boulder zone)	Trench : 1 line
23	Karashaky -A	48°15'43"	68°15'19"	Devonain volcanics	intense alt zone	N75E	S	Qz-Clay	Qz-Ser-Kao-Or		9	<0.01	<0.2	12.4	13	9.9	Ba:5360		2a?	1000 m × 300 m (Alteration zone)	Trench : 4 lines (Total 1,600m)
24	Karashaky B, C, D	48°16'	68°17'	Devonain volcanics	qz vein	E-W&NE	S	Qz-Clay	Qz-Ser-Kao		5	<0.01	<0.2	26.2	15	19.2	Ba:364		2a	4km×4km	Lots of Trenches (Total 1,600m)
25	Koktal	48°45'44"	68°48'15"	contacted of granitoid and diabase	qz veinlets	N30W	VW	Qz-Zeolite?	Qz-Pl-Or-Bi-Ser		3	<0.01	<0.2	76	5	35.3			4	400m×50m	Trench : 10 lines (Total 132m), Previous Drilling Hole : 2 sites
26	Kuzultas West	48°20'43"	68°53'11"	Devonain acidic volcanics	qz vein and breccia zone	N50W	W	Qz-Py		324-343	1	0.29	2.1	16.3	18	3.7			2a	20 m × 2 m (Quartz boulder zone)	
27	Luguvoe	48°41'07"	68°59'12"	Devonain volcanics	qz vein?														7		Previous Drilling Hole: 3 sites
28	N1	48°26'11"	68°56'30"	Lower Devonain volcanics	qz floats zone	N30E	W	Qz-Hem			5	<0.01	<0.2	18.5	23	5.1		Ht	7	120 m × 80 m (Quartz boulder zone)	
29	N2	48°30'03"	68°34'27"	Lower-Middle Devonain volcanics	qz floats zone	N80E	W	Qz			1	<0.01	<0.2	21.3	6	2.2			7	80 m × 60 m	
30	N3 (Koktem?)	48°36'28"	68°34'29"	Quartz porphyry, granite, porphyry	intense silicified zone	N40W	S	Qz				<0.01	<0.2	50.2	17	11.4		Ht, Go	2b?	300 m × 70 m (Silicified boulder zone)	
31	N4 (Shilde-1?)	48°37'58"	68°36'19"	Devonain volcanics	qz floats zone	N35E	W	Qz		246-379		<0.01	0.2	19.7	2	2.5			2a?	150 m × 1 m	
32	Reper	48°24'00"	68°47'30"	Lower-Middle Devonain rhyolitic volcanics	fissure filling zone, fissure develop randomly	NS (General trend)	M	Qz-Ser-Hem	Qz-Ser-Pl	234-305	7	0.07	5.6	58.5	643	177	As:928, Sb:103	El, Go, Lm	3	200 m × 50 m (Quartz vein and boulder zone)	
33	S1	48°28'18"	68°56'01"	Lower Devonain volcanics	Mineralization zone developing in the contact zone of Devonian and Carboniferous	N40W	M	Qz			1	<0.01	0.3	31.5	4	4			2a	80 m × 2 m	
34	S2	48°26'49"	68°46'56"	Lower Devonain f. gd acidic volcanics	qz network and brecciated zone. Mineralization zone developing in the contact zone of Devonian and Carboniferous	N75E	W	Qz			1	<0.01	<0.2	11.3	3	5.9			2a	150 m × 1 m	
35	S3	48°45'30"	68°18'30"	granodiorite, diorite (Karamendin) and sediment	qz veinlets	N35W	W	Qz			6	<0.01	<0.2	37	9	35.5		Cp, El			
36	S4	48°45'24"	68°57'55"	granodiorite	qz zone	N90E	M	Qz		134-328	4	<0.01	<0.2	14	4	5.4			2b	60 m × 2 m	Trench : 2 lines
37	Sartas	48°15'	68°57'	granite porphyry	qz network zone	N0E	W?	Qz-Hem	Qz-Ser-Anh-Pl	222-295		0.56	0.2	37.2	11	11.1	Ba:665	Iron oxides	2a?	50 m × 50 m	
38	Shenber-A	48°17'44"	68°04'44"	intense silicified rock	qz floats zone	N70W	S	Qz			4	0.01	<0.2	16.9	28	9.9	Ba:5360		7	<200 m × 100 m	
39	Shenber-B	48°18'38"	68°04'14"	Lower Devonain volcanics and upper Devonain sediment	qz floats zone	N80W	M?	Qz-Hem	Qz-Pl±Kao		4	<0.01	<0.2	14.6	8	57	Ba:4590		7	500 m × ?	
40	Shilde-2	48°36'	68°29'	sandstone (hornfels)	qz vein	NE	M	Qz			6	<0.01	<0.2	17.9	26	7.6	As:102.Ba:1940		4	100 m × 40 m	
41	Shubarkol	48°44'35"	68°46'35"	granodiorite (Karamendin) and Devonian volcanics	qz vein zone	N75E	W	Qz-Ser	Qz-Ser-Pl	126-169	8	0.04	0.4	36.7	333	21.5	As:29	Cp, Go, Jar, Lm	2a	1500 m × 2 m	Trench : 9 lines
42	Shubarkol NW	48°45'17"	68°46'10"	ditto	qz floats zone	ENE	W	Qz-Epi	Qz-Dol-Hor-Py	159-263	3	<0.01	<0.2	19.6	31	13.1		Cp, Go, Jar, Lm	2b	100 m × 50 m	
43	Sn1	48°17'	68°48'	Lower Devonian acidic volcanics	qz network zone	NE?	W	Qz-Clay-Py	Qz-Ser-Kao	220-306		<0.01	1	43.5	48	47.6		Go, Ht	7	8 km × 2 km	
44	Tamuz	48°32'	68°38'	Lower Devonian volcanics and sediment	qz floats zone	?	S	Qz-Hem	Qz-Pl±Kao ±Hem± Ser ±Bi±Or	156-165	6	0.62	7.7	91.6	1150	11.8	As:104, Sb:129	El, Cp, Mt, Py, Go, Lm	2a?	100 m × 100 m	
45	Uchastok "B"	48°12'	68°47'	granodiorite (Karamendin)	qz floats zone	N35E	W	Qz-Epi	Qz-Pl-Ser± Py±Cc	125-385	4	<0.01	<0.2	16.5	3	1.4			4?	100 m × 60 m	
46	Western Karamendin	48°34'	68°00'	quartz porphyry in Ordovician sediment	qz network and floats zone	N60E	W	Qz	Qz-Ser-Pl-Kao	175-404	7	0.02	17.7	51.3	901	170		El, Po	2a?	4km × 4km (Quartz boulder zone)	Lots of Trenches
47	Zhamantas II	48°38'	68°20'	granodiorite (Karamendin)	qz floats zone	?	?	Qz				0.01	<0.02	16.4	5	1.5			2b?	30 m × 30 m	Pit : 1 hole

Mineralization Type : 1. Porphyry type : Intrusive hosted quartz vein and disseminated sulphide mineralization (Samarsky porphyry type) ; 2 Gold bearing quartz vein type : Sulphide-gold mineralization hosted by Lower Devonian volcanics, with possible association to Upper Devonian granitic intursives (Ushoky type) ;
3 : Others, 3-1 Vein style quartz sulphide-Au mineralization hosted by Lower Devonian granitic rocks; 3-2 : Volcanic hosted disseminated and fracture controlled sulphide mineralization; 3-3 : Intrusive contact related quartz-sulphide veins; 3-4 : Miscellaneous occurrences

Table I -3-3-2 Summary of mineral occurrence and their characteristics in the Terektinsky Uplift Area (Detail-subdetail survey area)

No.	Mineral Occurrence Name	Host rock	Mineralization zone	Fault System Orientation	Alteration		Inclusion Homogen. Temp. (℃)	Metal Grade (This survey)	Ore Minerals (Polished Section)	Mineralization zone	Size of Alteration zone + Mineralization zone	Resources	Previous Prospectings
					Discription	X-ray Diffraction							
1	Central Zalturbulak (Aktau west)	diorite porphyry in Devonian andesite	Cu bearing qz network	NE-SW	Qz-Ser→prop	Qz-Ser-(Chl)→Py-Chl-Epi-Ca	>300 (from ore min. assemblage)	Cu : 1308,934ppm (MJTA-4, W=3m), Au : 477ppm (MJTA-4, W=3m)	Cp, Py, Mt, Po, Cb	Porphyry Cu-Au	0.3km×0.5km	-	Drilling Hole:2 sites, Trench:more than 10 lines
2	Central Zalturbulak (Aktau west)	granite in granodiorite	Cu, Mo bearing qz network	NE-SW	Qz-Ser→prop	Qz-Ser→Py-Chl-Epi-Ca	-	Cu : 645,605ppm (MJTA-3, W=1m), Mo : 400ppm (MJTA-3, W=3m)	Cp, Py, Mo, Mt, Po	Porphyry Cu-Mo	0.15km×0.5km	-	-
3	Central Zalturbulak (Western Zalturbulak)	ditto.	ditto.	NNW-SSE	Qz-Ser→prop	Qz-Ser→Py-Chl-Epi-Ca	205-324	Cu : 645,605ppm (MJTA-3, W=1m), Mo : 695ppm (MJTA-5, W=1m)	Cp, Py, Mo, Mt, Po	Porphyry Cu-Mo	0.7km×2km	-	Drilling Hole:4 sites, Trench:more than 15 lines
4	Zalturbulak prospect (Central Zalturbulak zone)	granodiorite	Au bearing qz veins (12 veins)	NNW-SSE	Ser→prop	Ser-Chl-Py	164-424	Au : 20.8ppm (W-4 vein ; grab), Au : 0.95ppm (C-1 vein ; W=30m), Au : 18.9ppm (P-5 vein ; W=1.5m), Au : 2.5ppm (P-4 vein ; W=1.5m), Au : 3.0ppm (P-2 vein ; W=1.6m)	El, Py, Cp, Mo, Thd, Gn, Mt	Au vein	300m×200m	7398kg (C1+C2): Prev. data	Costean:2 lines, Drilling Hole:more than 40sites, Trench:more than 15lines
5	NE Zalturbulak	hornblende diorite	vein type gold	E-W	prop	Epi-Chl-Ca	-	-	El, Py	Au vein	150m×80m	777kg (P2): USSR data	Drilling Hole:8 sites, Trench:8lines
6	Aktau	diorite in andesite	vein type gold	ENE-WSW	prop	Qz-Ser-Kao-Py→Chl-Epi	±170	Au : 17.1ppm (W=1m):USSR data	El, Py	Au vein	400m×400m	616kg (P2): USSR data	Drilling Hole:5sites, Trench:more than 30lines
7	Akmola	quartz porphyry, granitoids	Mo bearing qz network	NW-SE	Qz-Ser→prop	Qz-Ser→Py-Chl-Epi-Ca	150-360	Mo : 445ppm (MJTA-9, W=38m)	Mo, Py, Cp	Porphyry Mo	Mo mineralization zone ; L:±400m?, D:±100m?, W:20m	2Mt? (Mo:0.04%)	Drilling Hole:4sites, Trench:35lines
8	Arlan	diorite	vein type gold	NNE-SSW	Qz→clay→prop, tourmalline in silicified zone	Qz-Ser-Tour-Kao-Py-Chl-Epi	±180	Au : 4.16ppm (boulder)	Cp, Py, Po, El	Au vein	2000m×300m	-	Drilling Hole:4sites, Trench:more than 4lines
9	Bidaik	Lower Devonian dacite～andesitic volcanics	Au bearing qz vein	NS	Qz→Chl	Qz-Ca-Ser	129-288	Au : 29.08ppm (boulder)	El, Cp, Py, Oxides	Au vein	275m×20m	129kg (P2): USSR data	Drilling Hole:7sites 1031m, Trench:4lines 450m
10	Taguloba	granite porphyry	qz vein	NNE-SSW	Qz→Chl	Qz-Ser/Smec-Tour?	115-189	Au : 1.7ppm (boulder)	Iron Oxides	Au vein	800m×400m (Quartz veinlets)	-	Drilling Hole:1site 145.6m, Trench:9lines:3380m
11	BidaikNE (No.2 zone)	Devonian dacite～andesitic volcanics	Au bearing qz vein	NNE-SSW	silicified zone along qz vein	Qz-Ser-Ser/Smec-Lm	137-334	Au : 286～364ppm (boulder), Au : 0.93ppm (W=2m)	El, Cp, Py	Au vein	200m×2m (Qz vein)	-	Trench:1lines 10m
12	Kuzulutas zone SW	Lower Devonian acidic volcanics and cgl.	Qz-Hm-Ba veins	NW-SW	silicified zone along qz vein	Qz-Ser/Smec-Ca	183-243	Au : 0.9ppm (W=3m)	Cp, Py	Au vein	700m×100m	5330kg (P2,Depth 0-15m): USSR data	Drilling Hole:more than 3 sites, Trench:70lines 1250m (including zone SE)
13	Kuzulutas zone SE	ditto.	ditto.	E-W, WNW-ESE, NW-SE	silicified zone along qz vein	Hm-Ba, Qz-Ser/Smec-Ca	133.2-267.5 (especially 133.2-190)	Au : 0.36ppm (boulder)	Cp, Iron Oxides	Au vein	1400×600m	-	Trench:10lines 3380m
14	Kuzulutas zone NW	ditto.	qz veins and silicified rocks	E-W, N-S, NE-SW	silicified zone along qz vein	-	-	Au : 0.46ppm (boulder)	-	-	400×300m	-	-

According to Sengor et al (1993), Central Kazakhstan was placed in a new stress field after appearance of subduction zone in the southern part of Central Kazakhstan after early Carboniferous. The change of the regional stress field in Terektinsky uplift area mentioned above may correspond to the new appearance of the subduction zone. However this is only speculation because of poor evidences.

There are some mineral occurrences (Shenber, Karashaky and so on) which show E-W trend in southern part of Terektinsky uplift area. These occurrences have formed along reverse fault distributed nearby. No promising occurrences have been discovered in this area.