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MINERALIZATION ELEMENTS PERIODIC LAW AND DISCRIMINANT THEOREM OF METALLOGENIC GEOCHEMISTRY

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Abstract: The mineralization gene research of large and super large ore deposits has great theoretical and practical significance. Through the systematic comprehensive arrangement for lithostratigraphy geochemical and mineral resources data of North China Landmass, the author has found several important regularity knowledges on mineralization in the area. Mineralization geochemical gene lineages: it has a relatively close relationship between important metallogenic element distribution with the distribution of geological systems rock elements concentration Clarke $Kc \geq 1.20$ and variation coefficient $Cv \geq 0.80$. It highlights the decisive role of volatile compounds, mineralizers, complex anions and other hydrothermal components. The regional mineralization temporal-spatial evolution pattern: North China Landmass overgrowth continent-making movement hotspots that with iron content (Fe_2O_3+FeO) as a indicatrix, we has undergone a complete anti-clockwise super giant epeirogenic cycle, East Heibei Ar_1→Northwest Hebei Ar_2→North Hebei Ar_3→Taihang, Zhongtiao Pt_1→Xionger Pt_2→Erlangping Pt_3→East Qinling Pz→Jiaoliao Mz→Hannuoba Cz, this process restricts the space-time distribution of mineralization; Mineralization element periodic law: the main mineralization elements of the North China Landmass is hydrogen, carbon, sodium, magnesium, aluminum, silicon, potassium, calcium, iron and copper, zinc, molybdenum, silver, tungsten, gold, lead, uranium, etc. Mostly is the elements of oxyphilic rock-forming, sulphophile and biophile, low density and higher abundance. This is mutual combined result that region crustal evolution important geological events and elements geochemical natures. At last, this paper proposed the mineralization geochemical discrimination law : In the same tectonic unit, geological bodies that has cause relationships and space-time closely related, ore-forming elements and associated activation agents content changed enormous of enrichment and dilution , in a suitable geological structural positions, often to form large industrial ore deposits.

Keyword: Mineralization geochemical gene lineages; Regional mineralization temporal-spatial evolution pattern; Mineralization elements periodic law; Discriminant theorem of metallogenic geochemistry.

A large number of studies has shown that, extra large deposits are considered to be the product of anomalous mineralization in the event of "initating tidal resonance" in conventional mineralization, they have mineralization partiality, for mineralization elements, type, era and geological background has very obvious selectivity, and controlled by the abnormal mineralization structure convergence field. Based on the interaction processes of the earth's layer-spheres, mineralization dynamics linking the global metallization with the evolution of the universe and exploring the intrinsic causes of the deposits [1].

China's mineral resources potential evaluation research results show that, the tectonic framework controls the significant chemical abundance of rock and thus restricts the mineralization characteristics[2]. Distribution characteristics of geochemical anomalies and mineral deposit focus area, it reveals the close dependence relations between mineralization and crustal evolution, tectonization and crust-mantle mutual interaction [3]. Based on the data of 1300 gold-silver polymetallic ore deposits, the researchers established a large number of typical ore deposit geological geophysical geochemical prospecting[4].

The inhomogeneity of the chemical composition of crust and upper mantle has important control effect on regional metallization. China's eastern metal deposits show regular distribution characteristics, some large and medium-sized deposits are often accompanied by geochemical blocks of the corresponding elements, but the high large complete geochemical anomalies are only small deposits and even no deposits, or small anomalies on a low background was found a very large deposit, the circumstances is not rare. This requires a more profound level of mineralization geochemical system research.

In the study of mineralization geochemistry, the enrichment of chemical elements is the most important object for predicting mineralization, this work should be linked to the history of regional geology and regional geochemistry. We must find out the history of geology and mineralization - the chemical system, according to the geochemical diversity of elements, to predict known and unknown types of mineralization enrichment, identify the source of ore-forming elements and compiled the geochemical model of mineralization.

Based on the comprehensive study of large–scale and ultra-large deposits and petro-geochemical parameters in North China, this paper has proposed the geochemical gene lineages of large and super large-scale deposits in this area, temporal-spatial evolution model of mineralization, mineralization element period law, mineralization geochemical discrimination law and future prospecting direction.

1. **Geochemical mineralization system**

Institute of Geophysical and Geochemical Exploration, Chinese Academy of Geological Sciences (1986~1995), in the eastern China, were system collected 28253 rock samples of stratigraphic standard profiles and representative intrusive rock mass, the 62 elements in the combined samples were accurately determined, which provides the basic data for geochemical mineralization system research[5]. In the national mineral resources potential assessment work, the project team established a large number of typical deposits geochemical anomaly models.

Author with the stratigraphic group and intrusive rocks as the unit composed of parent populations, statistics rock elements concentration Clarke (A certain age rock mean / Eastern China crust abundance) and variation coefficient of different eras , listed a form.

The main mineral kinds in the mineralization system.

Meso-Archean: Fe-graphite-garnet and so on. Neo Archean: Fe-Au-Cu Co-Zn Pb Ag -B –graphite -garnet- mica -diamond. Paleoproterozoic: Fe-Au-Cu-B-Pb -Zn-Ag-Mo-serpentine nephereat, magnesite, dolomite, talc and graphite. Mesoproterozoic: REE – Nb – Fe – V – Ti – P – Pt –Pd –Mn –Cu –Pb –Zn –S –Cu –Mo –Pb –Zn -Ag-Limestone, asbestos, dolomite and so on. Neoproterozoic : Cu-Mo-Mo-W-quartzite, dolomite, limestone and diamond.

Paleozoic: Fe –Sn –Mo –W –Ag –Cu –Pb -Zn-Co-gypsum, coal gas, fluorite, limestone, bauxite, alumina and refractory clay. Mesozoic: Mn –Ag –Pb –Zn –U –Mo –Sn -W-Au-coal, zeolite, fluorite, tuff, bentonite and so on. Cenozoic: SiO_2, $CaSO_4$, C, NaCl, $NaCO_3$, $NaSO_4$, U and so on[6][7][8][9][10][11][12].

Geochemical genetic lineages in North China Landmass

Era	Rock elements concentration Clarke Kc sequence	Rock elements variation coefficient Cv sequence
Cz	As4.0267, Ta3.7667, H3.6231, C3.2267, Sb3.000, Cl2.7455, B2.7000, Cs2.3710, Nb2.1600,Mo1.8200, Sn1.8000,W1.7330, Be1.7200, Hf1.6650, U1.6000, Li1.5846, Ti1.5640, Ni1.5430, Fe^{3+}1.5371, P1.5280, Hg1.5000, Zr1.5000, Cd1.4250, Ca1.3356, Y1.3000, Ce1.2945, Th1.2900, Tl1.2750, Bi1.2429	Cl2.2715, H1.0268, FeO1.1761, C1.0260, Ni0.8628, P0.8285, Ca0.7939
Mz	Be2.3900, Cs2.0640, U2.0500, As1.9000, Sb1.8000, Th1.7167, Pb1.6923, Rb1.6190, Ta1.6667, Li1.6077, Au1.6000, K_2O1.5665, Nb1.5200, W1.4500, Hf1.4450, Zr1.4452, La1.4414, Ce1.4364, B1.3300, Ba1.3200, Mo1.3200, Y1.2867, Hg1.2750, $CO_2$1.2267, Tl1.1750, Ga1.1417, Bi1.1357, Ag1.1228	Au3.4925, $CO_2$2.6135, Cu1.5431, CaO1.5313, Hg1.1812, B0.9840, Cr0.9040, As0.8977, Sb0.8918, Pd0.7934, W0.7920, Se0.7856, P0.7635, Ni0.7362, H_2O0.7304, Pt0.7263, Cl0.7260, Sr0.7167, Mo0.7018, FeO0.6409, Bi0.6334, MgO0.6321, Co0.6364, Cs0.6070
Pz	$CO_2$8.6667, As2.9800, B2.8400, CaO2.5632, Sb2.2000, Cs2.1500,	Pd1.7424, S1.5666, H_2O1.2160, $CO_2$1.1908, CaO1.0638, MgO1.0374,

	Hg1.8380, U1.7800, Li1.7308, Th1.3850, Pb1.3308, Sn1.2083, W1.1830, Nb1.1600	Na_2O0.9429, Cl0.8766, Hg0.8792, Ni0.8541, Cr0.8147, Cu0.8110, Co 0.7885, Se0.7766, FeO0.7732, Pt0.7316, B0.7270, As0.7177, V0.7066, Sc0.7043, Sb0.6839, Ta0.6753, Ba0.6716, Nb0.6650, $Fe_2O_3$0.6441, K_2O0.6287, Be0.6238, Th0.6229, Au0.6013
Pt_3	$CO_2$6.2733, B3.5900, As3.3067, Sb3.2670, Hg2.7500, H_2O2.4000, Cs2.0500, CaO1.7943, U1.7200, Li1.5615, W1.5830, Pb1.5154, Be1.4800, Sn1.3917, Cd1.3125, Th1.3050, Rb1.2429, Mo1.2400	Pt1.2110, S1.1310, Cr1.0610, H_2O0.9721, Sb0.9179, Pd0.8633, Na_2O 0.8536, MgO0.8203, $CO_2$0.8188, As0.7950, Ni0.7620, Co0.7368, B0.6580, Sc0.6510, FeO0.6406
Pt_2	B3.4000,$CO_2$3.0867,Nb2.1800,Ta2.0000, MgO1.8429,H_2O 1.7769, W1.7170, U1.6500, Li1.5923, Be1.5200, Zr1.4932, Th1.4700, As 1.4267, Sb1.4000, Hf1.3675, Cs1.3640, Ce1.3164, La1.2862, Pb1.2231, P1.2190,CaO1.2142, Sn1.2000, Mo1.1800, Rb1.1143, K_2O1.1631,Y1.1067	Pd3.0531, Cr2.8050, Pt2.5429, Ni2.5207, $CO_2$2.4910, Th2.3158, W2.2888, Ta2.1954, Nb2.1830, U1.9266, B1.8100, Li1.4632, Co1.3452, MgO1.2767, Be1.2678,As1.2273, Zr1.1755, Sr1.1708, Hf1.1455, Bi1.0390, Sc1.0380, La1.0040, CaO0.9900, V0.9502, Cu0.9333, Hg0.9299, Cs0.9135, Ce0.9217, P0.8726, Na_2O0.8530, Se0.8504, H_2O0.8453, Rb0.8427, FeO0.8384, Ba0.8327, Au0.8230, Pb0.8101, Sn0.7503, Ti0.7439, K_2O0.7153, $Fe_2O_3$0.6991, S0.6459, Sb0.6063, Zn0.5972
Pt_1	Cs3.3210, As3.1933, B2.5700, $CO_2$1.9933, H_2O1.5308, Sb1.4670, Li1.4154, Hg1.3880, U1.3100, Be1.2900, Au1.2500, W1.2000, Sn1.2000	Cs2.2025, $CO_2$1.8810, As1.8397, Au1.1695, Hg1.0290, B1.0058, Pt0.9830,Pd0.9713,La0.9537,Sb0.9360,Sr 0.8585,Co0.8410, MgO0.7940, Cr0.7660, Sc0.7198, Ni0.7180, Cu0.7028, Se0.6788, V0.6760, Hf0.6190, P0.6110
Ar_3	H_2O1.3538, B1.2000, Be1.1900, Au1.1500	Pd1.7760, $CO_2$1.6746, Hg1.3150, Pt1.2760, As1.2540, B0.9846, Sb0.9547, Cr0.8628, Au0.7517, Se0.7239, W0.6720, Cs0.6437, Ni0.6288, S0.6020, B0.5867, Mo0.5766, Sc0.5555, U0.5505, Co0.5392
Ar_2	P1.64, Au1.47,Cd1.2625,Cl1.2545,Cr1.2500,Pt1 .1583.	P1.1760, Bi1.1235, U0.967, As0.9480, Pt0.9306, B0.9170, Pd0.9040, W0.8728, Cl0.844, Au0.8030, Se0.7260, Cs0.6717, Cr0.6430, Be0.6400, S0.6090, Rb0.6060.

2. Magmatic evolution, sedimentary differentiation and mineralization model

With Fe_2O_3 + FeO content as a basic magma eruption, crust and mantle activity quantitative indicator, we can find out, North China landmass growing hot spots, experienced a migration route Ar_1→ Ar_2 → Ar_3 → Pt_1→ Pt_2→Pt_3→Pz→Mz→Cz, just completed a super-giant anti-clockwise epeirogenesis（land forming） cycle. At the same time, it formed a cycle of the continental nucleus-craton-rift–valley accretion- plate collision - orogenic–down-warped. Continental crust from thickening to activation, this process can also be seen as ,the entire North China landmass from Ar to Cz, around a fixed mantle hot spot (Bohai Bay mantle plume) formed a super-giant clockwise cycle movement., this process of cycle movement control the basic law of regional mineralization.

The cumulative thickness of the strata in the Taihang mountains is 34km, Yanshan area stratigraphic construction cumulative thickness is 45km, with the thickness of the crust (Moho surface depth) 37 ~ 43km is very close.

From Ar to Mz, Fe_2O_3 + FeO content gradually decreased, and Cz come back returned to Ar level.

Fe_2O_3+FeO contents change from Ar to Cz in North China Landmass

Era	An Ar	Ar_1 *Cz*	Ar_2 *Sg*	Ar_2 *Cl*	Ar_3 Hq	Pt_1 *Gt*	Pt_2 *Xer*	Ch *d*	Pt_3 *Mt*	Pt_3 *El*	Pz *Df*	K L x	K L d	EN h	NL x
Fe_2O_3 +FeO	23. 45	19. 12	10. 32	9.0	10. 18	10. 05	10. 53	10. 24	9.1 0	8. 31	8. 77	6. 21	5. 63	11. 14	12. 67

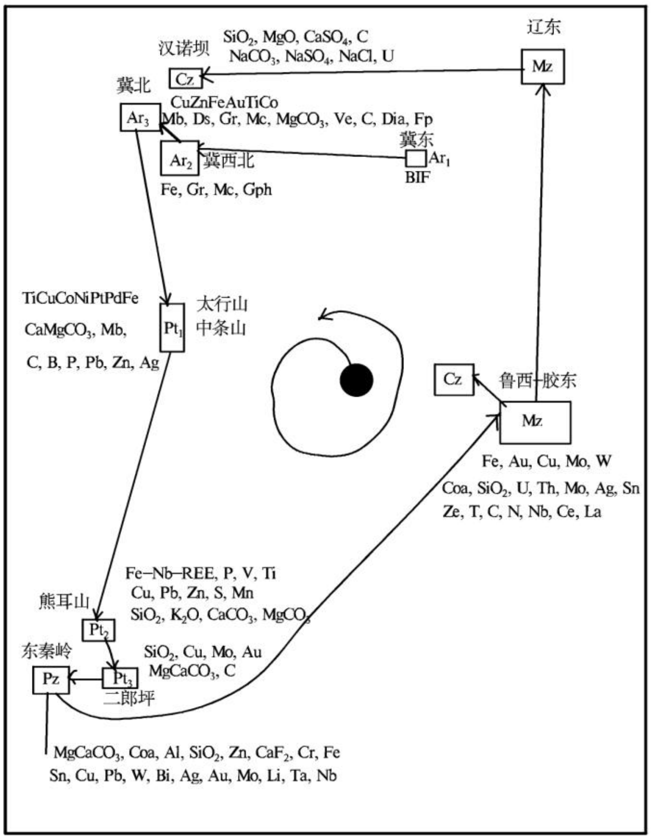

Fig.1 Pattern picture of accretion hot spots migration and regional mineralization in North China Landmass

In MesoArchean Ar_2 ,by Sanggan group, ChongLi group as the magma activity center, to the east the Miyun, Qianxi, Anshan, Yishui, to the south's Hengshan, Zanhuang, Huoxian, Xingtai in proper order evolved accretion. This process has formed striped magnetite quartzite, garnet, mica and graphite and other minerals. It experienced superimposed of the magmatic activity of the Variscian period and Yanshanian period, to form Au, Mo and other minerals.

The NeoArchean Ar_3, by the north Hebei Hongqiying group as the center, respectively, towards the eastern Qing yuan, Zunhua, Jianping, Shuangshanzi, Luanxian, Taishan, Jiaodong ,and to the southern Taihua, Chen Zhuang, Wutai, Jiangxian, Dabie, Luliang, Dengfeng, Wanzi, and the northern Jining, Ural hill, Alashan evolution accretion. This process has formed Cu, Zn, Fe, Au, Ti, Co, marble, cyanite, garnet, mica, magnesite, vermiculite , graphite, diamond, feldspar and other minerals. Late superposition formation of Pb, Zn, Ag, Au and other minerals.

Paleoproterozoic Pt_1, by Guantaohe group as the center, followed to southern Zhongtiao, Douling, Qinling, Hutuo, Shennongjia, Songshan group and the eastern Zhuahuangzi, Jiaonan, Fenzishan, Liaohe group, to the north Huade, Xinghuadukou, Baoyintu group evolution accretion, from continental volcanic rocks to marine carbonate transition. This process has formed Ti, Cu, Co, Ni, Pd, Pt, Fe, dolomite, marble, graphite, B, P, Pb, Zn, Ag and other minerals.

Mesoproterozoic Pt_2, from the northern edge the Pingquan-Chengde-Pinggu-Huairou, Changcheng System, Wendallkhan basic-ultra-basic magma island arc, and the southern edge the Xionger, Kuanping, Ruyang group intermediate-basic volcanic island arc, towards the middle part the BaiyunObo group, Changchneg system, Zhaertaishan group, Jixian System rift basin evolution accretion. From continental facies volcanic rock to marine facies carbonate rock transition. This process has successively formed the barite, fluorite, Fe-Nb-REE, P, V, Ti, Pt, Pd, Cu, Pb, Zn, S, Mn, quartz sand, potassium shale, dolomite, limestone, etc.

Neoproterozoic Pt_3, by Maotong group, Erlangping group as the center, respectively, towards Qingbaikou, Penglai, Bainaimiao, Luanchuan, Luoyu, Sinian System and the eastern part the Qinling - Dabie evolution accretion. This process has appeared quartz sand, dolomite, limestone and other minerals, later superimposed Cu, Mo, W, Au and diamond minerals.

Paleozoic Pz, by the south edge the East Qinling Danfeng group as the center, towards the central part evolution accretion, to Cambrian-Ordovician, the extensive development of marine sediments. The process has successively formed minerals such as dolomite, coal, clay, bauxite, ceramic soil, Zn, Bi, Ag, fluorite, Cr, Fe, Sn, Cu, Pb, W, Mo, Au, limestone and gypsum.

Mesozoic Mz, respectively, by Luxi platform uprise K, North Qinling T, Liaodong platform uprise K, Inner Mongolia axis J, Yanshan platformal fold belt J as the center, towards the around expand evolution. This process has formed Fe, Au, Cu, Mo, Pb, Zn, S, W, coal, quartz sand, U, Th, Ag, Sn, zeolite , tuff, bentonite, granite, diamond, oil shale, Nb, Ce, La and other minerals.

Cenozoic Cz, by Luxi basaltic N, northern Hebei Hannah dam basalt ENh as the center, towards the depression basin, valley and lake and beach tidal spread, and finally end in aeolian sand. This process has formed olivine, diatomite, gypsum, peat, lignite, oil shale, natural gas, quartz sand, stone salt, trona, mirabilite, sandstone immersion type U and other minerals, reflecting the arid climate of the evaporation environment as the dominant.

3. Regional mineralization elemental periodic law

Elemental enrichment mineralization is the result that the combination of major geological events and elemental geochemical characteristics, during the regional crustal evolution, at the same time, the spatial and temporal distribution pattern of important minerals is also affected by the degree of ore-forming theory research and prospecting exploration.

According to elemental periodic law and geological age, Author finishing in northern China large, super large minerals, has found several regularity knowledges: (1) Mineralization elements partiality: The main mineralization elements in the area are H, C, Na, Mg, Al, Si, K, Ca, Fe and Cu, Zn, Mo, Ag, W, Au, Pb, U etc., mostly oxyphilic rock-forming, sulphile biophile, low-density, high-abundance elements.（2）Mineralization age partiality: Compared to other times, in the Mesoproterozoic, the Mesozoic mineralization elements are rich and varied.（3）Geochemical gene lineages: important distribution of ore-forming elements have a more closely related with the rock elements concentration Clarke Kc≥1.20 and variation coefficient Cv≥0.80 in the system of different geological times. From which to highlight the decisive role of the volatiles, mineralizers, anions and other hydrothermal components.（4）Future prospecting direction: The deep-seat and peripheral of known deposits and exploration of new minerals, such as Pt, Pd precious metals, iron family V, Cr, Ni, Co, rare scattered elements Sc, Zr, Hf, Ta, alkali metal Rb, Cs, it is possible to obtain prospecting breakthrough.（5）Comprehensive retrieves utilize: Associated mineralizer elements As, Sb, Bi, Hg, Sn such as ultra-low-grade comprehensive recycling is also worthy of attention in the field of research.

4. Discriminant theorem of metallogenic geochemistry

Based on the above research results, the author puts forward the discriminant theorem of metallogenic geochemistry: In the same tectonic unit, geological bodies that has cause relationships and space-time closely related, the mineralization elements and associated activator levels have undergone great changes in enrichment and depletion(concentrated Clarke Kc≥1.20, variation coefficient Cv≥0.80）, in the appropriate geological structural positions, often to form large and super-large scale important industrial deposits.

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Synopsis of the author

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Era	H	Li	Be	B	C	F	Na	Mg	Al	Si	P	S	Cl	K	Ca	Sc	Ti	V	Cr
Cz	3.6231	1.5846	1.7200	2.7000	3.2267						1.5280		2.7455		1.3356		1.5640		
Mz		1.6077	2.3900	1.3300	1.2267									1.5665					
Pz		1.7308	1.6700	2.8400	8.6667										2.5632				
Pt_3	2.4000	1.5615	1.4800	3.5900	6.2733										1.7943				
Pt_2	1.7769	1.5923	1.5200	3.4000	3.0867			1.8429			1.2190				1.2142				
Pt_1	1.5308	1.4154	1.2900	2.5700	1.9933									1.1931					
Ar_3	1.3538		1.1900	1.2000															
Ar_2											1.6400		1.2545						1.2500
Ar_1	2.2615	1.3846	1.2900								1.7460		1.2909			1.2720		1.2455	1.4048

Era	Mn	Fe^{3+}	Fe^{2+}	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Rb	Sr	Y	Zr	Nb	Mo	Pd	Ag
Cz		1.5371			1.5430					4.0267				1.3000	1.5000	2.1600	1.8200		
Mz										1.9000		1.6910		1.2867	1.4452	1.5200	1.3200		
Pz										2.9800									
Pt_3										3.3067		1.2429		1.2267		2.1800	1.2400		
Pt_2		1.2191								1.4267					1.4932		1.1800		
Pt_1										3.1933									

Ar3																			
Ar2																		1.1818	
Ar1			2.0604		1.2000	2.0730					1.4818				1.3200			2.1545	1.5263
Era	**Cd**	**Sn**	**Sb**	**Cs**	**Ba**	**La**	**Ce**	**Hf**	**Ta**	**W**	**Pt**	**Au**	**Hg**	**Tl**	**Pb**	**Bi**	**Th**	**U**	
Cz	1.5250	1.8000	3.0000	2.3710		1.1931	1.2945	1.6650	3.7667	1.7330			1.5000	1.2750		1.2429	1.2900	1.6000	
Mz			1.8000	2.0640	1.3200	1.4414	1.4364	1.4450	1.6667	1.4500		1.6000	1.2750	1.1750	1.6923		1.7167	2.0500	
Pz		1.2083	2.2000	2.1500						1.1800			1.8380		1.3308		1.3850	1.7800	
Pt3	1.3125	1.3917	3.2670	2.0500		1.2862				1.5830			2.7500		1.5154		1.3050	1.7200	
Pt2		1.2000	1.4000	1.3640			1.3164	1.3675	2.0000	1.7170					1.2231		1.4700	1.6500	
Pt1		1.2000	1.4670	3.3210						1.2000		1.2500	1.3880					1.3100	
Ar3																			
Ar2	1.2625											1.4700							
Ar1	1.7500							1.4225			2.6250						1.2433		

Table1 Units distribution form of elements concentration Clarke *Kc*≥1.20 in North China Landmass

Era	H	Li	Be	B	C	F	Na	Mg	Al	Si	P	S	Cl	K	Ca	Sc	Ti	V	Cr
Cz	1.0268				1.0260						0.8285		2.2715		0.7939				
Mz				0.9840	2.6135										1.5313				0.9040
P	1.				1.							1.	0.		1.				0.

z	2160				1908							5666	8766		0638				8147
Pt3	0.9721				0.8188							1.1310							1.0610
Pt2	0.8453	1.4632	1.2678	1.8100	2.0491		0.8530	1.2767			0.8726				0.9900	1.0380		0.9502	2.8050
Pt1	1.8810			1.0058											0.9537				
Ar3				0.9846	1.6746														0.8628
Ar2				0.9170							1.1760		0.8440						
Ar1				2.6101												0.8424	0.9133	0.9340	2.0359
Era	Mn	Fe^{3+}	Fe^{2+}	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Rb	Sr	Y	Zr	Nb	Mo	Pd	Ag
Cz			1.1761		0.8628														
Mz						1.5431													
Pz					0.8541	0.8110												1.7424	
Pt3																		0.8633	
Pt2			0.8384	1.3452	2.5207	0.9333				1.2273	0.8504	0.8427	1.1708		1.1755	2.1830	1.2079	3.0531	
Pt1				0.8406						1.8397			0.8585					0.9713	
Ar3										1.2540								1.7660	
Ar2										0.9480								0.9040	
Ar1	0.8946	1.1794	1.2742	0.9484	1.6218	1.1432				2.3167		0.9675	1.4921		1.1073				
Er	Cd	Sn	Sb	Cs	Ba	La	Ce	Hf	Ta	W	Pt	A	H	T	Pb	Bi	Th	U	

a C z										u	g	l				
Mz	0.8918							0.7920		3.4925	1.1812					
Pz											0.8792					
Pt_3	0.9179								1.2110							
Pt_2		0.9135	0.8327	1.0040	0.9217	1.1455	2.1954	2.2888	2.5429	0.8228	0.9299		0.8101	1.0390	2.3158	1.9266
Pt_1	0.9363	2.2025							0.9828	1.1695	1.0295					
Ar_3	0.9547								1.2760		1.3150					
Ar_2								0.8728	0.9306	0.8030				1.1235	0.9200	0.9670
Ar_1			1.8129	0.8322									1.1570	0.8946		0.9311

Table2 Units distribution form of elements variation coefficient Cv≥0.80 in North China Landmass

Era	H	Li	Be	B	C	F	Na	Mg	Al	Si	P	S	Cl	K	Ca	Sc	Ti	V	Cr
Cz	■				■		■	■		■		■	■		■				
Mz	■				■		■	■	■	■		■		■	■				
Pz	■	■			■	■	■	■	■	■		■			■				
Pt_3					■			■		■					■				
Pt_2	■			■	■	■		■		■	■	■		■	■		■	■	
Pt_1	■				■			■		■	■						■		
Ar_3	■				■		■	■	■	■		■		■	■		■		
Ar_2	■				■			■	■	■					■				
Ar_1																			

Era	Mn	Fe^{3+}	Fe^{2+}	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Rb	Sr	Y	Zr	Nb	Mo	Pd	Ag
Cz																			
Mz	■	■	■			■	■	■	■							■	■		■
Pz		■	■	■		■	■									■	■		■
Pt_3	■					■											■		
Pt_2		■	■			■	■							■		■	■	■	■
Pt_1		■	■		■	■	■										■	■	■
Ar_3		■	■			■	■										■		■
Ar_2		■	■	■													■		
Ar_1		■	■																

Era	Cd	Sn	Sb	Cs	Ba	La	Ce	Hf	Ta	W	Pt	Au	Hg	Tl	Pb	Bi	Th	U
Cz																		■
Mz		■				■	■			■		■			■		■	■
Pz		■							■	■		■			■	■		
Pt_3										■								
Pt_2	■				■	■	■	■	■		■	■			■		■	
Pt_1											■	■			■			■
Ar_3										■		■			■			
Ar_2												■						
Ar_1																		

. Table3 Mineralization elements periodic law in North China Landmass

The blackened part in the table indicates that large and medium-sized mineral deposits have been proved ascertain