

DISTRIBUTION OF SOME RARE ELEMENTS IN THE CHAM DERE PALEOGENE MAGMATIC GROUP, EASTERN RHODOPE

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ABSTRACT. The Cham Dere Group is composed of the acidic magmatic rocks from the late extensional Paleogene magmatism in the Northeastern Rhodopean Depression. This group includes the sequentially formed complexes as follows: Borovitsa rhyolite, Bryagovo rhyolite, Panichkovo trachyrhyolite, Murgен trachyrhyolite, Gradishte trachyrhyodacite, and Tri Mogili dyke ones.

These complexes are characterized with close contents of the studied rare elements (Rb, Nb, Y, Zr, Sr), which supports the assumption that the rocks are a result of the evolution of common magma chamber.

The results from the diagrams constructed to evaluate the type of tectonic environment are rather contradictory (Nb-Y; Rb-Y+Nd; Y-SiO₂; Nb-SiO₂; Rb/Zr-SiO₂). This is, probably due to the fact that these diagrams do not count for regions of extension as is accepted for the Rhodopean Massif. From the results obtained it can be concluded that using only one type of diagram to determine the tectonic environment is incorrect and unreliable.

РАЗПРЕДЕЛЕНИЕ НА НЯКОИ РЕДКИ ЕЛЕМЕНТИ В ПАЛЕОГЕНСКАТА ЧАМДЕРЕНСКА МАГМЕНА ГРУПА В ИЗТОЧНИТЕ РОДОПИ

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РЕЗЮМЕ. Чамдеренската група обединява киселите магмени скали на късноекстензионния палеогенски магматизъм в Североизточнородопската депресия. Тя включва последователно формираните Боровишки риолитов, Бряговски риолитов, Паничковски трахириолитов, Мургенски трахириолитов, Градищенски трахириолитов и Тримогилски дайков комплекси.

Тези комплекси се характеризират с близки съдържанията на изследваните редки елементи (Rb, Nb, Y, Zr, Sr), което подкрепя предположението, че те са резултат на еволюцията на една обща магмена камера.

Резултатите от дискриминационните диаграми за типа на тектонската обстановка са силно противотечиви (Nb-Y; Rb-Y+Nd; Rb-SiO₂; Y-SiO₂; Nb-SiO₂; Rb/Zr-SiO₂). Това вероятно се дължи на факта, че те не отчитат областите на екстензия, за каквато се възприема Родопският масив. От получените резултати може да се направи извода, че определянето на типа на тектонската обстановка само по един тип диаграма е ненадежно и некоректно.

Geological setting

Cham Dere magmatic Group includes the acidic volcanic rocks of the Northeastern Rhodopean Depression (Borovitsa volcanic region according to Иванов, 1960). This depression has formed during Paleogene in the region between the Central Rhodopean Dome and the Harmanli Block. Its origination has been connected with the processes of extension and exhumation of the metamorphic core complexes in the Rhodopean Massif (Ivanov, 2000; Georgiev, 2004, 2005).

Terrigenous and carbonate rocks have deposited at the base of the depression during Paleocene-Eocene. At the end of Priabonian and during Rupelian the depression has been an arena of intensive volcanic activity. The initial magmatic acts in the region (Priabonian-Lower Rupelian) are characterized by medium acidic composition (Sumitsa Group; Георгиев, Милованов, 2006а). The later phases (Rupelian) are of acidic composition (Cham Dere acidic Group; Георгиев, Милованов,

2006b). The materials of Cham Dere Group display differentiated areal of distribution and it as been proposed that they are a result of the activity of one magmatic chamber (Georgiev, Milovanov, 2005).

The magmatic rocks of Cham Dere Group fill up the Borovitsa caldera (volcano-tectonic depression; Иванов, 1960). Also, several extrusions, tens of dykes and rare tuff spots crop out beyond the caldera boundaries (Fig. 1). They are localized predominantly in east-northeast direction from the caldera and mainly along the Bukovitsa fault sheaf (Topolovo-Pilashevo fault belt, Боянов, Маврудчиев, 1961).

The following complexes have been distinguished in Cham Dere magmatic group (Георгиев, Милованов, 2006б): Borovitsa rhyolite, Panichkovo trachyrhyolite, Murgен trachyrhyolite, Gradishte trachyrhyodacite, Tri Mogili dyke, and Bryagovo rhyolite ones. The rocks of Borovitsa, Murgен, and

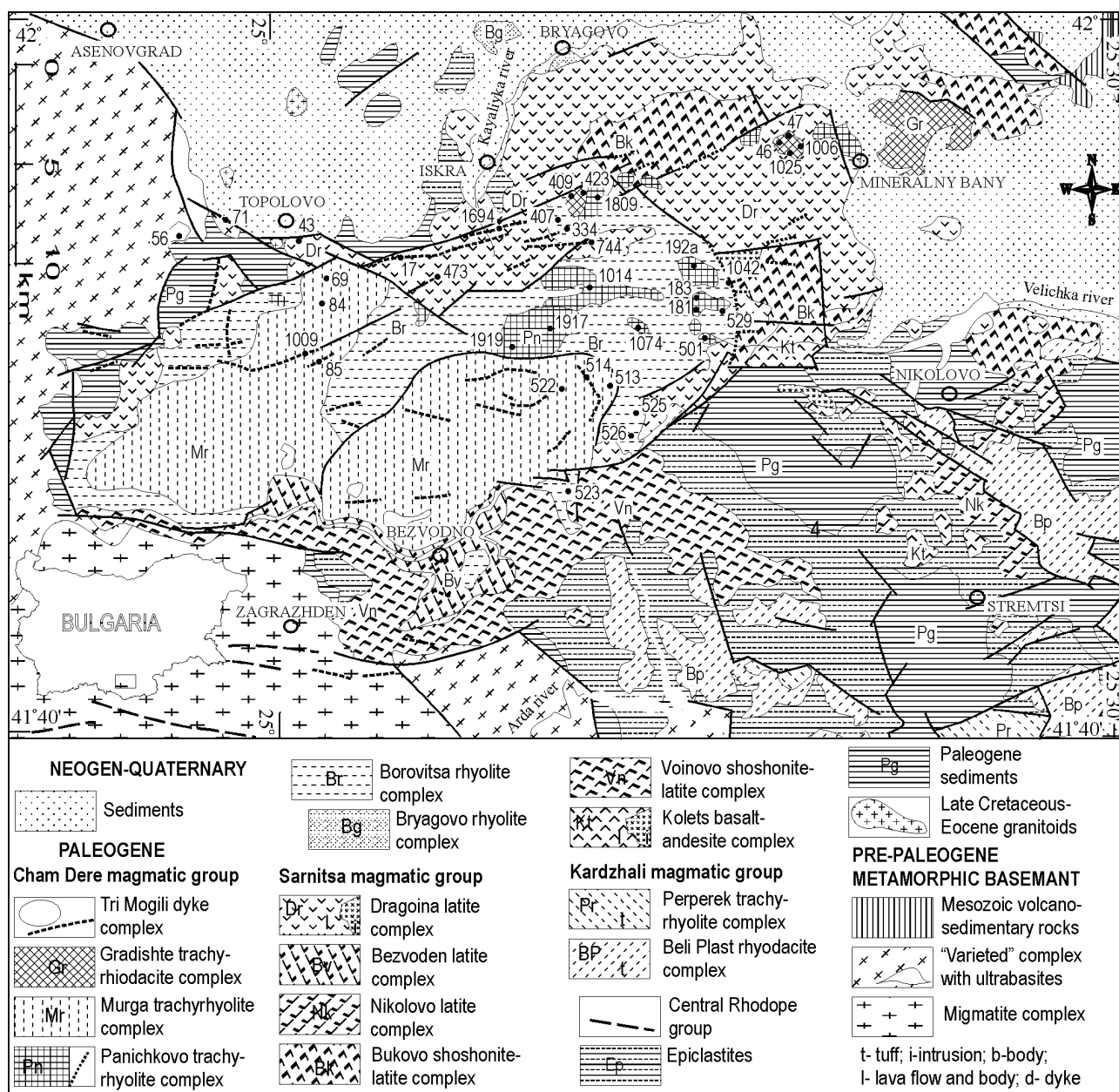


Fig. 1. Map of magmatic complexes in the Northeastern Rhodope Depression

Bryagovo complexes display explosive facies and those of Panichkovo, Gradishte, and Tri Mogili – effusive and subvolcanic ones.

Results

Significant differences in the distribution of the studied rare elements (Rb, Nb, Y, Zr, Sr) are not registered for the specified complexes of Cham Dere group (Fig. 2) Only Borovitsa complex displays a little bit higher contents of strontium.

The results obtained for the character of the tectonic environment by use of the constructed diagrams are contradictory and under discussion (Fig. 3). The points even from one and the same complex fall in fields of different tectonic environments. A very rough tendency is observed for prevalence of points in the fields of the collisional and

syncollisional granites. For Surnitsa medium acidic magmatic group from the same depression the tendency is different. In this case the points fall in the fields of the within plate granites.

Discussion

The rocks of the separate complexes of Cham Dere magmatic Group do not differ significantly in respect to contents of the studied rare elements (Rb, Nb, Y, Zr, Sr). The obtained data support the assumption that the magmatic complexes of Surnitsa Group have a common origin and are result of a separate phase from the development of one magma chamber (Георгиев, Милованов, 20066).

On the constructed diagrams the results for the type of tectonic environment are very contradictory and mutually excluding. This is probably due to the fact that it was not

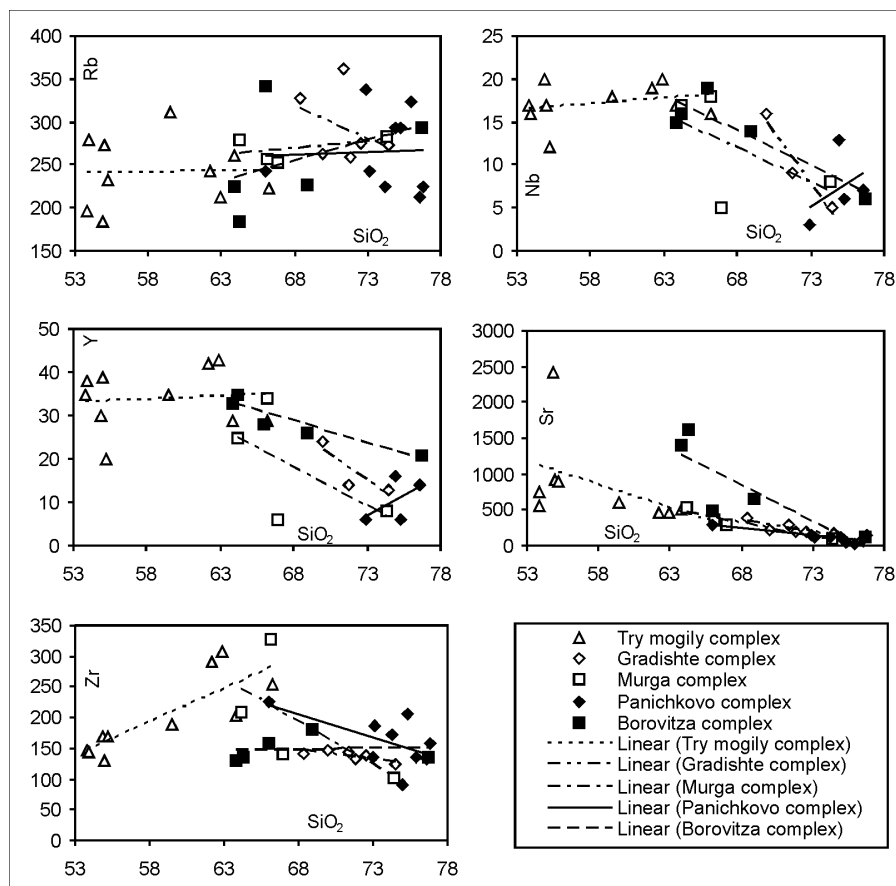


Fig. 2. Diagrams showing distribution of Rb, Nb, Y, Zr, Sr in rocks from the Cham Dere Group

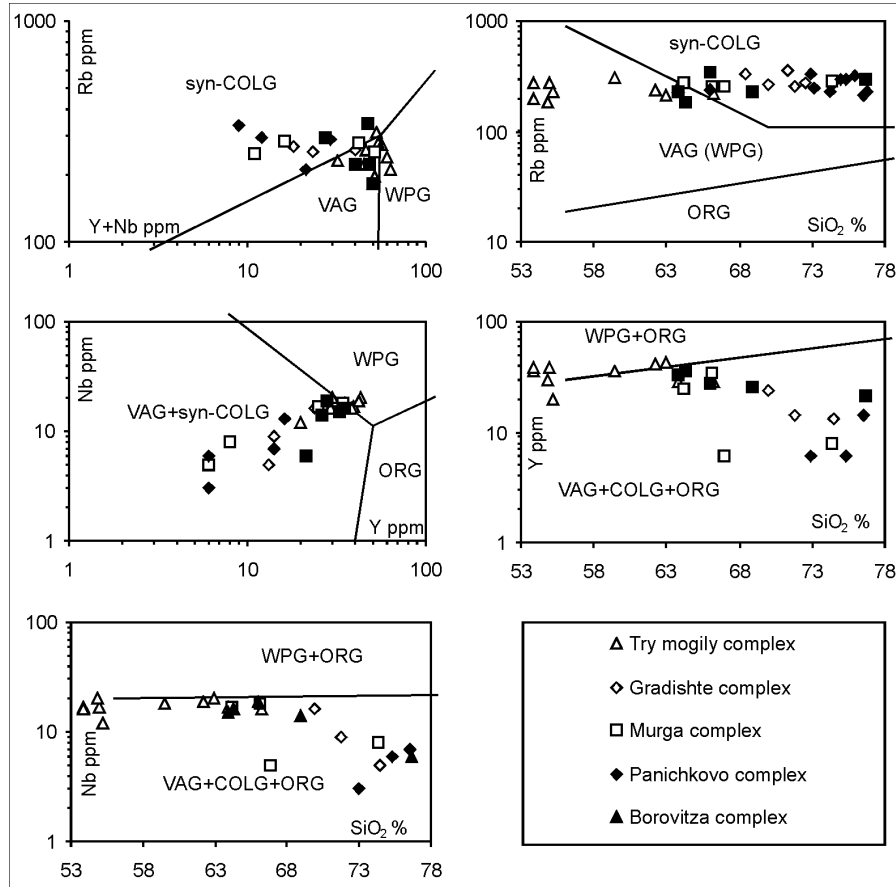


Fig. 3. Discrimination diagrams for the tectonic environment of the Cham Dere Group (according to Pearce et al., 1984 ; Harris et al., 1986)

Table 1
Representative analyses of Chan Dere group

No	SiO ₂	Rb	Nb	Y	Sr	Zr
Try mogily complex						
514	53,80	197	17	35	567	148
17a	54,97	273	17	39	917	130
1009	62,94	212	20	43	470	307
56	62,20	242	19	42	457	290
744	59,49	311	18	35	600	189
85	63,86	260	17	29	500	202
1416	66,23	223	16	29	390	253
473	54,87	184	20	30	2420	168
43	55,20	232	12	20	897	168
1694	53,89	280	16	38	748	145
Gradishte complex						
409	74,50	272	5	13	171	124
423	71,80	258	9	14	201	133
1014	69,96	262	16	24	215	146
47	68,36	328			387	142
48	71,32	362			283	144
1025	72,50	274			203	138
Murga complex						
513	74,38	284	8	8	101	103
522	66,90	252	5	6	302	142
69	66,16	257	18	34	370	327
84	64,21	279	17	25	530	210
Panichkovo complex						
1917	72,96	337	3	6	153	136
1919	76,55	213	7	14	101	132
1809	75,30	294	6	6	41	205
1042	66,00	242			302	227
181	74,23	225			123	173
183	76,84	225			134	158
192	73,16	243			112	187
529	74,93	293	13	16	117	90
1006	75,94	323			30	136
Borovitza complex						
334	68,90	226	14	26	655	181
407	76,70	294	6	21	109	135
523	66,00	341	19	28	495	157
525	63,85	225	15	33	1403	131
526	64,24	185	16	35	1611	136

counted for the regions of extension as is accepted for the Rhodopean Massif. Yanev (1998) has determined syn-COLD type but using only the Rb/SiO₂ diagram and studying only the acidic rocks in Eastern Rhodopes. From the obtain results in

this study it can be concluded that determining the type of tectonic environment by use of only one diagram is unreliable an incorrect, especially for the case of the Rhodope massif.

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