Lithostratigraphy and formation conditions of Maastrichtian-Paleocene deposits in Krumovgrad District

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Abstract. A formal lithostratigraphy of the Maastrichtian-Paleocene deposits in Krumovgrad district is worked out. Krumovgrad Group with two formations is distinguished: Savar breccia Formation and Kandilka sandstone-conglomerate Formation. The formation of the rocks in the Krumovgrad Group in graben structures is a result of a collision compression coinciding in time with Laramian phase. The specific tectonic regime of the formation of those rocks predetermined the formation of a thick colluvial-proluvial train, which consists of coarse-terrigenous and lake-marshy fresh-water sediments. The newly obtained data allow to view in a different light the origin and development of the East Rhodope Paleogene Depression. Its beginning is considered to be in Maastrichtian-Paleocene, while it could be called East Rhodope Maastrichtian-Paleogene Depression.

Introduction

Paleocene in the East Rhodopes was first established and proved by Atanasov, Goranov (1984). Later the same authors, in a summarizing publication (Goranov, Atanasov, 1989) again dwelt on those deposits and with new fossil data confirmed their Maastrichtian-Paleocene age. Goranov et al. (1989, in press) call those sediments continental, coarse terrigenous calcareous formation while Boynov et al. (1989, in press), Kojucharov et al. (1990, in press) and Goranov et al. (1990, in press) use the name “Krumovgrad Group”, although this name did not meet all requirements of the Stratigraphic Code.

In the present paper this name is officially introduced by the type sections of two formations, which are lying one over the other or are substituting each other laterally. The phytofossils were determined by E. Palamarev and the pollen — by S. Cernjaviska.
Lithostratigraphy

Savar Breccia Formation (Шаварска брекоча свита)

Nomenclature. The name of the formation comes from the village of Savar, south of the town of Krumovgrad (Fig. 1). It is introduced herein for the first time as a formal lithostratigraphic unit. Its sediments are described by Вълков (1967) as a first breccia-conglomerate horizon of pronouncedly olistostrome nature and Priabonian age.

Type and subsidiary sections. As a type section we point out the outcrops along the Kaldzik dere River, south of the village of Savar to the point of its exit in the terrace of the Krumovitsa River, as well as the outcrops along the slopes around the village of Savar and the hamlet of Soyka (Fig. 1). The section is as follows (Fig. 2):

- Cover — Coal-bearing sandy formation — Upper Eocene
  15. Over 5 m thick-bedded, medium- to coarse-grained calcareous sandstones. Grey to beige in colour; bedding — horizontal.
  - hiatus, washout, transgressive boundary —
  Savar breccia Formation
  14. About 30 m of thin-bedded, dark-grey to black clayey limestones and marls, at some places — silicificated; bedding — horizontal. The following Characeae al-

Fig. 1. Geological map of the Maastrichtian-Paleocene deposits in Krumovgrad district
1 — Precambrian metamorphic basement — Cepelare Formation: hornblende gneisses, amphibolites, marbles; Maastrichtian-Paleocene: 2-4 — Savar Breccia Formation: 2 — boulder-block-like breccia, 3 — grey, dark-grey, black thin-bedded marls and clayey limestones and biothermal calcareous structures entirely built of phytofossils, 4 — olistolith or part of a thrust plate; 5 — Kandilka Sandstone-conglomerate Formation; 6-7 — Upper Eocene cover; 6 — breccia-conglomerate formation; 7 — coal-bearing-sandy series; 8 — faults; 9 — place of column section
gae were separated from the dark-grey limestones and determined: *Nitellopsis* cf. *heliotricha* (B r i n g) L. G r a m b e t e t S o u l i t é - M ä r s c h e, with a range Montian — Thanetian — Ypresian, and *Nitellopsis sigali* (L. G r a m b.) L. G r a m b. e t S o u l i t é - M ä r s c h e, range Thanetian — Ypresian. In the upper parts of the packet, near the hamlet of Soyka a calcareous biohermal structure is observed. It is mainly built of stromatolites and other phytofossils. Those limestones are recrystallized, and are grey, beige or brown in colour.

13. About 10 m mainly boulder breccia with sandy cementing mass and fragments of amphibolites, gneisses and a small amount of marls; sorting is not observed; texture — breccia-like, disorderly.

12. Olistoplaka — 40 m, consisting of two strongly fragmented tectonic parts: gneiss — amphibolitic and marble.

11. Breccia — 10 m, similar to that of packet 13.

10. Alternation (10 m) of thin-bedded, dark-grey to black clayey limestones and marls; bedding — horizontal.

9. Boulder (15 m) to block-like unsorted breccia; marble fragments predominating.

8. Olistoplaka (50 m) of alternating grey marbles, calc-schists, amphibolites and gneisses; tectonically affected to such a degree that at some places it is a tectonic breccia, almost without any cementing mass, and the separate fragments, of different orientation, cling close to one another.

7. Sandstones (15 m) — thick-bedded, coarse-grained, beige, passing into fine-pebble conglomerates; bedding — horizontal.

6. Block-like, unsorted polygenetic breccia (20 m) with fragments of amphibolites, gneisses, marbles and quartzites.

5. Marls and clayey limestones (20 m) — black, thin-bedded, rich in finely dispersed organic matter; bedding — horizontal.

4. Polygenetic conglomerates (10 m) — thick-bedded, coarse-pebble to boulder-like, with sandy cementing mass; the fragments are mainly of gneisses, amphibolites and marbles.

3. Marls and clayey limestones (15m) — dark-grey to black, thin-bedded, rich in fine-dispersed organic matter; bedding — horizontal.

Fig. 2. Type section of Savar Formation
1 — gneisses, marbles, amphibolites; 2 — tectonically strongly changed olistoplates of gneisses, marbles and amphibolites; 3 — unsorted boulder-block-like breccia; 4 — conglomerates; 5 — sandstones; 6 — sandstones with individual conglomerate fragments; 7 — black marls; 8 — clayey limestones; 9 — limestones; 10 — limestones built of phytofossils; 11 — deposit of phytofossils.
in dispersed organic matter. In the upper part of the packet there is a lens of coals, 20 cm thick; the coals being partly silicificated. Under the coals in the marls a level of sideritic concretions has been established. The concretions are of septarium type and are up to 30 cm in diametre.

2. Coarse-boulder to block-like unsorted breccia (100 m); fragments mainly of amphibolites, marbles, gneisses and red quartzites; the cementing mass is sandy.

— hiatus, washout, discordant boundary —

1. Base — Čepelare Formation (Кожураов, 1984) presented by alternating varied gneisses, amphibolites and marbles.

The subsidiary sections are presented in Fig. 3:

a) The section 3a is immediately east of the village of Ovčari (Fig. 1). The differences with the type section are the following: in the base there are also serpentinites (packet 1); packet 3 is a sevenfold repetition of the following succession: breccia, grey to black limestones, clayey limestones, marls and coals; at some places under the coals, there are sideritic concretions in the limestones; also in the limestones there indeterminable freshwater gastropods (according to E. Kojumdzieva). In marls, with much reservation, the following species have been established: Pityosporites sp. — pollen of coniferous, distribution in Mesozoic — Tertiary, and Monocolpollentis cf. Interpollis supplingensis (Pfl.) K rutzsch. — pollen of angiosperms, distribution in Upper Maastrichtian — Lower Eocene. The reference section ends by a transgressive occurrence of the sandstones from the coal-bearing-sandy series over a first olistoplaka.

b) Section 3b is further to the east and passes immediately to the west of the village of Svraka (Fig. 1). The specific factor, which adds to the type section here is the development of thick compact layers of dark-grey to black clayey marls to calcareous argillites with thin interbeds of sandstones (packet 3). Besides that packet 4 is a strongly consolidated tectonic (underthrust) breccia.

c) Section 3c characterizes the easternmost outcrops of the formation and passes in the gorge west of the village of Daskari (Fig. 1). Here the lower boundary is a tectonic one, and the formations covered transgressively by a breccia-conglomerate formation which belongs to the Upper Eocene. In packet 3,9 layers are presented, which consist of dark-grey and black aleuritic, clayey marls, alternating with sandstones, clayey sandstones and breccia. In the upper part of the packet, from the aleuritic marls were determined numerous specimens of Microchara tunicata L. Gramb. et Gutierrez, 1977, which is spread in Maastrichtian—Danian. The abundant presence of sporangii Characeae and ostracodes in those marls makes them look blotchy. Besides, there were casts of freshwater gastropods in the same marls also pyritic concretions are found.

Defining characteristics and lithologic characterization. The main feature of the formation is its coarse-terrigenous, olistostrome nature. It consists mainly of unsorted, without bedding, boulder to block-like polygenetic and monogenetic breccia. The breccia fragments are gneissic, amphibolitic and marble, at some places being almost only marble. In most of the cases the cementing mass is coarse-sandy. In some areas the breccia is built of close clinging angular fragments, and it gradually passes into strongly fragmented olistolite or olistoplaka. The breccias and, more precisely, the cementing mass are coloured in grey and grey-green. Another characterizing rock component are the thin-bedded, dark-grey and black marls, clayey limestones and limestones, which build packets at several levels. It is worth noting that these fine-grained sediments associate with thinner or thicker beds of breccia. The thin-bedded limestones at some places pass into biothermal structures built of stromatolites and other phytosilic. e.g. tubular reed-like plants. The third characteristic feature is the presence of large olistolites and olistoplakas, imbedded in two levels of the upper parts of the sections. The surface between the olistoplates and the below lying sediments is irregular, due to the pressure the plate exerted at the time of its movement over them. The elements of such a thrust plate occupy about 11 km² (Fig. 1). In the formation, although occupying comparatively smaller part, there are beds of sandstones and conglomerates, which
Fig. 3. Subsidiary sections of the Savar Formation: 3a — the village of Ovcari; 3b — the gorge west and south of the village of Svraka; 3c — the gorge west of the village of Daskari
1 — gneisses, amphibolites, marbles, serpentinities; 2 — boulder-block-like breccia; 3 — strongly thickened and hydrothermally altered breccia; 4 — tectonically affected olistoliths of gneisses, amphibolites and marbles; 5 — breccia-conglomerates and conglomerates; 6 — sandstones; 7 — marls; 8 — aleuritic marls; 9 — black marls and clayey limestones; 10 — limestones; 11 — deposit of phytofossils
allow a lithologic correlation with the Kandilka Formation. At the places where the bedding in the Savar Formation is well expressed, the layers are sinking to the north or north-northeast at a slope of 15° to 40°. In the western outcrops of the formation the layers strike almost N-S, due to tectonic reasons, while the layers are steeply sinking westwards at an angle of 30°-40°.
Distribution, correlation, thickness and chronostratigraphic range. The Savar Formation is stretching as a comparatively narrow band starting west of the hamlet of Soyka and coming to an end east of the village of Daskari (Fig. 1). It occurs discordantly over different levels of the Çepelare Formation. At certain places this boundary is tectonic. Over the materials of the formation transgressively and discordantly occur the sediments of the breccia-conglomerate and coal-bearing sandy formations which belong to the Upper Eocene.

The Characeae algae from the upper parts of the type section which have been found and determined (Fig. 2), give the age range of the formation: Montian—Thanetian—Ypresian, i.e. Paleocene—Lower Eocene. In the black aleuritic marls of the subsidiary section — 3b (Fig. 3) Characeae were determined, which showed Maastrichtian—Danian age. These data allow to establish, sufficiently precisely, the age of the Savar Formation as Maastrichtian—Paleocene, in some areas its formation reaches Lower Eocene.

Kandilka Sandstone-conglomerate Formation (Кандилка пясъчниково-конгломератова свита)

Nomenclature. The formation is named after the village of Kandilka 8 km southwest of the town of Krumovgrad. In the present paper it is introduced for the first time as a formal lithostratigraphic unit. Its deposits have been described up to now as a first breccia-conglomerate horizon (Горанов, 1960; Иванов, 1960).

Type section (Fig. 4). The base of the section lies in the gorge, about 500 m east of the village of Kandilka (Fig. 1). The section stretches to the north of that point, reaching about 150 m northwest of the height 482.5.

Cover — Breccia-conglomerate formation — Upper Eocene.

8. Coarse-grained sandstones (20 m) — grey to beige in colour, thick-bedded with horizontal and cross bedding; contain individual coarse fragments of rocks like in packet 9.

7. Polygenetic boulder to block-like breccia-conglomerates (20 m) — grey, poorly sorted; thick-bedded with coarse horizontal bedding. With respect to composition the fragments are similar to those of the upper packets.

6. Biohermal calcareous structure (5 m); entirely built of remains of higher plants (leaves, fruit elements, branches etc.). In fact this is bank entirely built of phytogenetic and phytomorphic limestones. The following species have been determined here of family Platanaceae — Protophyllum sp. (cf. P. sternbergi. Lesq., P. zaissanicur Romaff); distribution — Upper Cretaceous—Paleocene, and of family Arecaceae — Palmophyllum sp. (cf. Trachycarpus sp.); distribution — Paleogene.

5. Irregular alternation (120 m) of thick-bedded, medium- to coarse-grained sandstones with pebble to boulder polygenetic conglomerates (fragments of gneisses, amphibolites, marbles, pegmatites, quartz) The sorting of the conglomerates is poor. The sandstones and conglomerates substitute each other at short distances: cross and horizontal bedding. The sandstones often bear individual fragments of conglomerates. The sediments of the packet are grey in colour.

— concordant boundary with transition —

Base — Savar Formation of Maastrichtian—Paleocene age.

4. Pebble to boulder breccia-conglomerates (20 cm) — grey and beige, poorly sorted. The fragments are of gneisses, amphibolites, pegmatites, quartz and marbles.

3. A layer (3 m) of dark-grey limestones, entirely built of carbonitized phytofos-
sils and their detritus; the limestones are partly recrystallized; the fossils are indeter-
mineable.

2. Coarse boulder to block-like unsorted breccia (50 m); fragments of amphibolite, marbles and gneisses; the cementing sandy mass is very poor and in some places the frag-
ments are in a very close contact.

— hiatus; washout, discordant boundary —

1. Čepelare Formation (Кожухаров, 1984), presented by alternating gneis-
ses, amphibolites and marbles.

Defining characteristics and lithologic characterization. The most characteristic
feature of the formation is that in its greater part it is built of alluvial sandstones and
conglomerates, which are substituting at short distances, both vertically and laterally.
A characteristic element of the formation is also the lens-like body of biohermal
limestones. The layers of the Kandilka Formation are dipping monoclinal NW
at an angle of 30°-35°.

Distribution, correlation, thickness and chronostratigraphic range. Within the area
described the Kandilka Formation is poorly spread immediately to the north and south
of the village of Kandilka (Fig. 1). It occurs concordantly over the Savar Forma-
tion. It is accepted that the base of the Kandilka Formation may be determined on the
bases of the appearance of the thick allu-
vial sandstones and conglomerates. It is
transgressively overlaid by a breccia-con-
glomerate formation of Upper Eocene age.
It should be noted that the boundary is
very difficult to be traced due to the simi-
lar type of materials in the two lithostrati-
graphic units. South of the village of Kandi-
lka, the Kandilka Formation is substituted
by the Savar Formation, which is building
a band towards the village of Golyama
Činka. South of this village, the breccia-
conglomerate formation which is coloured
in bright-red, occurs transgressively and
by an angular discordance over the Savar For-
ation (Горанов et al., 1990, in press).

The higher plants found in the upper
part of the section, in the biohermal lime-
stones (Fig. 4) determine the age range
of the formation, i.e. Upper Cretaceous-
Paleocene.

Fig. 4. Type section of the Kandilka Formation
1 — gneisses, marbles, amphibolites; 2 — boul-
der-block-like breccia; 3 — breccia-conglomerates;
4 — conglomerates; 5 — sandstones; 6 — sandsto-
nes with individual conglomerate fragments; 7 —
limestones built of phytofossils; 8 — deposit of
phytofossils
Krumovgrad Group (Крумовградска група)

Nomenclature. The group is named after the town of Krumovgrad. It is introduced for the first time in the present paper as a formal lithostratigraphic unit. Its type area lies in the southwest, south and southeast of the town of Krumovgrad (Fig. 1).

Defining characteristics. These are: coarse-terrigenous character of the group (coarse-fragmented conglomerates, unsorted breccia with olistostrome nature, at some places olistoliths and olistoliths) and layers or packets of dark-grey and black clayey limestones, as well as phyto-genetic and phytomorphic limestones.

The Krumovgrad Group consists and is defined by the following two formations: Šavar Breccia Formation and Kandilka Sandstone-conglomerate Formation, described and nominated above with the same defining characteristics. Due to tectonic reasons, in the area of the village of Šavar, direct correlations between the two formations have not been observed. But in the section near the village of Kandilka it is quite obvious that the Kandilka Formation overlies the Šavar Formation (Fig. 4), while south of the village they probably are substituting each other (Fig. 1, Fig. 5). Besides this, it should be noted that both formations, building the Krumovgrad Group are proved to belong to Maastrichtian-Paleocene.

The Krumovgrad Group is well observed as a band in an area southeast and south of the town of Krumovgrad, of the hamlet of Dâskari to the west to the village of Šavar and after an interruption southwestwards to the village of Kandilka and the village of Golyama Činka (Fig. 1). To the east and west of these places the Group is not present due to tectonic reasons. Almost within the entire space the group is presented by a typical diastrophic facies determined by the rapidly rising boards of the grabens and the synsedimentary thrust processes. An exception here are the sediments of the Kandilka Formation, which is presented by prolluvial-alluvial deposits.

On the basis of phytofossils the age of the group is determined to be Upper Cretaceous—Paleocene and more precisely Maastrichtian—Paleocene.

The Krumovgrad Group overlies discordantly strongly washed surface of the crystalline basement or is bounded by tectonic dislocations. It is covered transgressively and discordantly by the breccia-conglomerate and coal-bearing sandy formations which belong to the Upper Eocene.

Formation conditions of the Maastrichtian-Paleocene deposits

Before the formation of Maastrichtian—Paleocene deposits in the Krumovgrad district, i.e. before the Maastrichtian, the Rhodope Massif was probably a poorly drained, inactive dry land, over which a weathering crust could not develop. As a result of collision, during Maastrichtian and Paleocene times, the crystalline base was fragmented and a system of continental, one-sided grabens appeared; they were outlining the southern edge of the inceptive East Rhodope Paleogene Depression (Laramian phase). Vertical movements of large amplitude were realized over a complicated tectonic zone, almost directed E-W between the villages of Podrumče and Golyama Činka (Fig. 1). At that tectonic environment, between the rising southern block and lowering northern block, a very active relief was created and extremely intensive denudation processes were pro-
Fig. 6. Scheme-model of the development of the Maastrichtian-Paleocene grabens
ceeding. In those grabens, a coarse, subareal sedimentation of materials from the ad­
joining metamorphic rocks (Fig. 6) occurred. In some areas the sediments are mainly
colluvial-prolluvial and in others — prolluvial-alluvial. Along the steep relief were
formed boulder block to giant block slope breccias of rockfalls, screes and landslides
but at the same time short, temporary and very active water flows exported material
into the prolluvial train, as a result of which breccia-conglomerates, conglomerates,
and sandstones were formed (Figs 2, 3). The fine-fragmented and psammitic component
are subordinate in amount and play the role of matrix of the large fragments. In some
other areas the uplifting was not so intensive and the prolluvial train is mainly built
of conglomerates and sands (Fig. 4). In that case, the materials were probably carried
into the grabens by longer water arteries. The thickness of the coarse-fragmented depo­
sits of the colluvial-prolluvial train reaches 400 m.

The powerful uplifting and the formation of a very active relief was substituted by
periods of comparative tectonic calmness, when over the prolluvial train were formed
not large and shallow lake-marshy basins on the basis of negative forms characteristic
of rockfalls and landslides (Fig. 6, b, e). At the same time the climate was mild and
humid, which allowed the growth of abundant lower and higher flora on the land and
in the water basin. Favourable conditions for carbonate sedimentation and formation
of organogenic and chemical limestones were created in the lakes. The main organisms
generating carbonate sediments, were the various types of freshwater algae, which give,
the characteristic of the Krumovgrad Group, stromatolitic and oncolitic limestones.
As a result of a chemical precipitation, oolitic, pisolitic and micro-grained limestones
were formed. The specific phyto-detrital limestones are also well presented. The latter
were formed as a result of metasomatic substitution of whole plants or parts of them.

In certain lake basins there were conditions for the development of a rich plank­
ton, the remains of which formed at the bottom of the basins, under reduction condi­
tions, calcareous sapropelic mud. During lithification it turned into dark-grey to black
thin-bedded limestones.

It should be stressed that the freshwater fauna (presented by gastropods and ostra­
codes) in the basins was comparatively poorer.

The carbonate type of sedimentation in the freshwater lakes suggest considerable
carbonization of the waters, as well as a mild climate. Most probably, a substantial
role for the enrichment of the waters with (acid) calcium hydro carbonate played the
karst waters coming from the marble massifs of the adjoining land.

At a certain moment the lakes were filled in, changed into marshes and later into
peat bogs, where plant material accumulated. In that environment the thin coal layers
and the siderite concretions, connected to them, were formed.

The evolution of the basins is indicated by a specific succession: over the coarse­
elastic deposits lie grey to black limestones, which upwards pass into marls, clay and
coals (Fig. 3a). This succession is observed repeatedly in the sections, which suggests
a certain cyclic recurrence and periodical realization of similar sedimentation environ­
ments.

The development of the tectonic zone is characterized not only by differential
vertical movements but also by well expressed horizontal movements. As a result of the
latter, plates of the crystalline basement moved to the north towards the grabens.
Remains from these phenomena can be well observed around the villages of Savar,
Ovčari and Svraka, about 1-1.5 km inwards the graben (Figs 1, 2, 3). The thrusting was
realized both over the crystalline complex and over the already formed Maastrichtian—
Paleocene sediments (Fig. 6, c, f). As a result of the mechanical influence of the thrust­
ing masses near the thrust surface, the metamorphic rocks were strongly fragmented,
ground and anew cemented, turning into typical tectonic monogenetic breccia. On
their part the sediments were also strongly consolidated. Thrust plates have been es­

tablished on two levels in the upper parts of the section of the Krumovgrad group (Fig.
2), i. e. those movements were performed twice. In front of the thrust usually a collu­
vial breccia was formed (Fig. 3b, 3c and Fig. 6).
The rock and mineral composition of the breccias and the other terrigenous rocks in the Krumovgrad Group show that the source province was the immediate crystalline basement. An exception is only the lowermost lying breccia, which besides marbles, amphibolites and gneisses also bears fragments of red quartzites, rocks which cannot be established now in their proximity. Minerals and fragments showing volcanic activity at that time have not been established.

The role of diagenesis for the formation of the coarse-terrigenous Maastrichtian—Paleocene rocks is difficult to be determined. It is assumed that they were formed under well expressed oxidation conditions. In contrast, in the sediments, from which the coals, black argillites, marls and limestones originated, the diagenesis proceeded in well expressed reduction environment, further defined by the presence of pyrite and siderite. For the small lake-marshy basins it could be said that there is a change of the pH values. The sedimentation and preservation of the carbonate substance in the sediments during the lake stage suggest a poor alkaline medium, while during the marsh stage, pH obviously had lower values.

The Maastrichtian—Paleocene deposits underwent more intensive tectonic deformations in comparison to those of Upper Eocene. The rocks of the Krumovgrad Group are more lithified and the processes of recrystallization of the limestones are better expressed; crystalloblastic structures having been formed. Silicification is observed and the organic substance is more deeply altered. One of the results of the stronger catagenesis in the Maastrichtian—Paleocene rocks is expressed in the difficult extraction of pollen from the rocks. On its part the pollen has undergone considerable alterations, due to which its determination is almost impossible.

Conclusions

a) The formation of the Krumovgrad Group rocks in graben structures is a result of a collision coinciding with the time of Laramian phase. The organogenic remains in the sediments of the group considered are mainly presented by flora. The paleofloristic data unambiguously point to a Maastrichtian—Paleocene age.

b) After the Krumovgrad Group had been deposited, structures, connected with the appearance of Ilirian phase, were formed. Over them a red breccia-conglomerate series, belonging to Upper Eocene, was deposited transgressively and discordantly in grabens close to the old ones. In this connection, during Lower and Middle Eocene the Early Paleogene relief of the Rhodope Massif was peneplained and over it weathering crust was formed, the denudated materials of which gave the red colour of the breccia-conglomerate formation.

c) The specific tectonic regime, at which the deposits of the Krumovgrad Group were formed, predetermined the formation of a thick colluvial-prolluvial train, consisting of coarse-grained and lake-marshy freshwater deposits.

d) The new data obtained allow to view in a different light the inception and development of the East Rhodope Paleogene Depression (Иванов, 1960), which was first distinguished by Гълбов (1938) as Sultan-Erijsko Depression. Its inception is now set in Maastrichtian—Paleocene, and it could be called East Rhodope Maastrichtian—Paleogene Depression. This also shows that the geological events during Maastrichtian and Paleocene times, so characteristic of other parts of our country and outside it, on an equal footing have affected the Rhodope area.

References


6 Geologica Balcanica, 22. 3

Вълков, В. 1967. Олистостромни явления в приабона южно от Кръмовград. — Сп. Бъл. геол. д-во, 28, 3; 368—373.

Горанов, А., Боянов, И., Атанасов, Г. 1989. Литостратиграфска подялба на палеогена и неогена от Източните Родопи и корелацията ѝ с палеогена и неогена от Горна Тракия. — Год. СУ (in press).


Гълбов, Ж. 1938. Родопският кристален цокъл в поречето на Горна и Средна Арда. — Geologica Balc., 3, 1; 29—40.

Иванов, Р. 1960. Магматизъм в Източнородопското палеогенско понижение, част I — геология. — Тр. геол. Бълг. Сер. Геол. и пол. изкоп., 1; 311—387.