

Palaeogene sediments (Mechit Formation) near Panagyurishte and Strelcha (Sredna gora Mts.)

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Ив. Боянов, Ив. Загорчев, Ал. Горанов. — Палеогеновые осадочные породы (Мечитская свита) в районе Панагюриште и Стрелчи (Средногорие). Новоустановленная Мечитская свита сложена континентальной последовательностью — речными конгломератами и песчаниками, местами — с глинистыми прослоями и обугленными растительными обломками. В гальках представлены породы доальпийского основания (гнейсы, амфиболиты, граниты и пегматиты) и верхнемеловые (коньяк-кампанские) осадочные, вулканические и плутонические породы, а также — оруденения. Мощность Мечитской свиты более 570 м. Она залегает несогласно на маастрихтском флише и на более древних меловых и домеловых породах. В домеловом основании ее породы заполняют денудационные карманы и обнажаются в виде нептунических кластических даек. Возраст свиты определен как позднемаастрихтский-датский на основании видов, принадлежащих к группе Normapolles. Установленные факты свидетельствуют о значительной расчлененности и об эрозии позднемелового Средногорского орогена еще в позднемаастрихтское время, а также — о существовании речной сети, переносящей снежный материал к северу и востоку в узкий морской залив Эминского флишевого трога.

Abstract. The newly-introduced Mechit Formation is a continental (fluvial) sequence of conglomerates and sandstones with occasional clays and coalified plant debris. The pebbles derived from pre-Alpine basement rocks (gneisses, amphibolites, granites, pegmatites) and Upper Cretaceous (Coniacian — Campanian) sedimentary, volcanic and intrusive rocks and ores. The formation is more than 570 m thick. It covers with unconformable depositional contact Maastrichtian flysch and older Cretaceous and pre-Cretaceous rocks, and forms denudation pockets and neptunian clastic dykes in the pre-Cretaceous basement. On the basis of taxa from the Normapolles group, the formation is referred to uppermost Maastrichtian — Danian. The new data point at the existence of a considerably eroded relief of the Late Cretaceous Srednogorie orogen already in late Maastrichtian time, and of a fluvial system draining the region towards North and East — into the then existing narrow sea gulf from the Emine flysch trough.

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Key words: Palaeocene; Srednogorie zone; palaeogeography.

Introduction

The Palaeogene sediments south of the towns of Panagyurishte and Strelcha have been first mentioned as polygenic conglomerate by Bonchev (Бончев, 1907). Hristov (Христов, 1953, 1960) made a thorough mapping (with area exaggeration at the expense of Upper Cretaceous sandstones) and parallelized these

rocks with the Middle Eocene sediments in the central parts of Stara planina (Balkan) range. Dimitrova et al. (Димитрова et al., 1984) claimed for the same rocks a Late Cretaceous (Maastrichtian) age. Similar sediments have been found in denudation pockets and neptunian clastic dykes as a cover over the gneisses and granite of the Sushtinska Sredna gora block ("anticlinorium") (Чунев et al., 1966),

and have been considered (together with all other post-Cretaceous sediments in the Panagyurishte and Strelcha areas) as Priabonian. Recently (Аладжова-Хрисчева et al., 1991), the Palaeogene sediments south of Panagyurishte and Strelcha have been referred to the marine Middle Eocene (Lutetian) Staropatitsa Formation.

The present authors made field revisions and palynological analysis aiming at a determination of the age and lithology of these sediments within the scope of the projects 503 (National Fund "Scientific Research") and "Geology of Bulgaria" (Geological Institute of the Bulgarian Academy of Sciences). The preliminary results have been already published (Zagorchev et al., 2001a). The palynological analysis made by S. Chernyavska and P. Pavlishina (Zagorchev et al., 2001a; Pavlishina, 2002) has proven a latest Maastrichtian – Danian age. The present publication aims to summarize the whole stratigraphic evidence gathered for to enable further palaeogeographic and palaeogeodynamic interpretations.

The death of our esteemed colleagues and close friends S. Chernyavska and I. Boyanov came before the finalization of our studies. This publication is also a tribute to their memory.

Mechit Formation (new formation: Мечитска свита)

Name. The Formation is named after the peak Mechit situated south of Strelcha, west of the type section.

Historical notes

Hristov (Христов, 1953) mapped 4 strips of sediments attributed by him to the Palaeogene (Middle Eocene). The authors of the geological map on the scale 1:100 000 (Илиев, Кацков, 1990) fully accepted the northernmost (Mechit) strip, and considerably reduced the area of the second (from north to south) strip entirely rejecting the other two (near the villages of Banya and Buta, and the prolongation to Popintsi).

During our studies we have visited several sections of all four strips mapped by Hristov (Христов, 1953). The two southern strips as well as most of the third (Popintsi) strip turned to be built by Upper Cretaceous sediments. Thus, the Palaeogene sediments are confirmed, with additional outcrop reduction and some tectonic detailization, within the out-

crops shown on the geological map 1:100 000. Most of the sections are not sufficiently exposed. Therefore, we describe here (Fig. 1) only the type section (Strelchanska Louda Yana south of Strelcha) situated in the Mechit strip, and the reference section situated near the spring Rayna Knyaginya north of the village of Popintsi (situated in the Popintsi strip).

Defining features. Mechit Formation consists of coarse terrigenous continental sediments: conglomerates with smaller amounts of sandstone and coal-bearing siltstone. The pebble composition corresponds to 1) the composition of the basement of the Srednogorie zone exhibited mostly in the Sredna gora crystalline block: Precambrian two-mica, biotite and hornblende gneisses, amphibolite, Palaeozoic hornblende-biotite, biotite and two-mica granites, pegmatite and quartz as well as the Late Cretaceous intrusive and dyke rocks and the ore related to them; 2) the composition of the Late Cretaceous Srednogorie zone: Upper Cretaceous andesites, dacites and trachytes, tuff, sandstone and marl. The rocks of the formation build irregular beds. Denudation pockets and neptunian clastic dykes are also present. The Mechit Formation covers with depositional contact all pre-Palaeogene rocks of the Srednogorie zone that crop out in the area.

Lithological composition

The Mechit Formation is built up mostly of polygenic conglomerates. The dimensions of the pebbles broadly vary: from several millimeters to tens of centimeters and up to 1.2-1.5 m. The pebbles are usually well rounded, and the forming rocks show different degree of weathering. A thin weathering crust is often visible. The lithological composition of the pebbles usually corresponds to the immediate neighboring environment, and namely: 1) Upper Cretaceous volcanic rocks: almost black and massive basalts (with rare phenocrysts), reddish and gray well-crystallized latites and dacites, greenish differently crystallized andesites, and (rarely) light-gray rhyodacites and dacites; 2) Upper Cretaceous intrusive rocks: subvolcanic to hypabyssal monzonites, quartzdiorites, granodiorites and syenodiorites; 3) Upper Cretaceous sedimentary rocks (marls, sandstones); 4) Palaeozoic granitoids (from the Poibrene quartzdiorite pluton, or the Smilovene granodiorites and granites) and pegmatites; 5) rarely and only in some exposures (but abundant in the denudation pockets and neptunian clastic dykes NNW of Pana-

gyurishte) biotite and two-mica gneisses and migmatites, and amphibolites.

Sandstones are present as separate beds tens of centimeters to several meters thick. They are of a grayish or yellowish colour. The grain dimensions greatly vary, and the sandstones show all transitions from coarse-grained through medium-grained to fine-grained sandstones and sandy siltstone. The cement is usually clayey, and less frequently a carbonate one. Millimetric to centimetric pebbles are often included in the abundant sandstone mass. The clay content is relatively small. Coalefied plant debris are sometimes abundant, and the rock becomes a coal siltstone to sandstone.

Description of the sections

Strelchanska Louda Yana — type section

The type section of the Mechit Formation is studied along the path at the eastern bank of the Strelchanska Louda Yana River south of the town of Strelcha.

— fault contact with the andesites, tuffs and marls of the Upper Cretaceous; the fault strikes 120° and dips 60-80° NNE.

(20) 45 m polygenic conglomerate built up of well-rounded pebbles from Cretaceous volcanic and igneous rocks

(19) 12 m polygenic conglomerate with 3 sandstone interbeds, each 0.6-0.8 m thick

(18) 60 m polygenic conglomerate

(17) 2.5 m polymictic sandstone with isolated pebbles and with thin seams of coal-bearing fine-grained sandstone; bedding 125°/70°NNE sample 11/99

(16) 300 m polygenic conglomerate with interbeds (0.5-0.8 m) of coarse-grained sandstone with isolated pebbles

(15) 0.4 m tectonized coal-bearing siltstone, bedding 140°/55°NE sample 10/99

(14) 20 m polygenic conglomerate, pebble dimensions up to 10-15 cm, locally thin interbeds of polymictic sandstone

(13) 3 m polymictic sandstone

(12) 15 m polygenic conglomerate, pebbles up to 30-40 cm

(11) 1.5 m coarse-grained polymictic sandstone

(10) 4 m polygenic conglomerate

(9) 3 m sandstone; in the upper part — angular pebbles (up to 2 m) from reddish-gray marl

(8) 50 m polygenic conglomerate

(7) 5 m coarse- to medium-grained sandstone, in the lower part — coarse breccia of marl angular pebbles

(6) about 40 m without outcrops

(5) 2.5 m polymictic sandstone with isolated pebbles, and polymictic conglomerate

(4) 5 m polygenic conglomerate built up of medium-sized to coarse pebbles

(3) 8-10 m coarse-grained polymictic sandstone with isolated pebbles

(2) 30 m polygenic conglomerate

(1) thin (2-10 cm) siltstone to shaly sandstone rich in coal substance sample 9/99 — coal-bearing siltstone

— lower contact: tectonized surface striking 160°/40-50°ENE over tectonized andesite.

Reference section at the spring

Rayna Knyaginya

north of Popintsi (Plate I)

(the section is strongly disturbed by normal faults)

Part 1, from bottom to top, from the first outcrops towards the fountain and spring:

(basement: tuffs, marls and sandstone of the Upper Cretaceous)

— unconformable depositional contact

(1) 30 m polygenic conglomerate, pebbles from 0.5 to 50-60 cm built up mostly of Upper Cretaceous volcanic rocks (andesite, dacite, rarely basalt) and intrusive rocks (monzodiorite, granodiorite); pebbles derived from weathered coarse-grained quartz-diorites to plagiogranites of the Palaeozoic Poibrene pluton are also abundant but less frequent

(2) 25 m thick-bedded yellowish to grayish sandstone rich in mica grains, locally — with coalefied plant debris; well exposed in the little quarry above the fountain; bedding 90°/25°N

sample M1/2000

sample M2/2000

(3) 40 m polygenic conglomerate, with the same composition, pebbles usually between 5 and 20-30 cm but reaching up to 120 cm, within abundant coarse sandy matrix within the conglomerate: low-angle normal fault, strike 130°/15°SW, striae on the slickenside 200°/14° immediately south of the highest point of the ridge: normal fault, strike 80-90°/60°S

North of the fault: about 20 m of tuffs, breccia and gray marls (Upper Cretaceous) in a narrow horst

sample M5/2000: marl

subparallel normal fault, strike about 95°, steep dip angle; along the continuation of the section to the north, the whole sequence is in overturned position (southern dips)

Part 2

(3a) about 5 m polygenic conglomerate

(2a) 15 to 20 m: thick-bedded coarse-grained

sandstone, bedding $90^{\circ}/45^{\circ}\text{S}$, over fine-grained sandstone with slumping and cross bedding sample M3/2000 — sandstone, about 5 m beneath the lower boundary of the conglomerate sample M4/2000 — fine-grained sandstone beneath the coarse sandstone

(1a) polygenic conglomerate (without clear outcrops, only scattered pebbles; undetermined thickness) basement: sandstone, tuff, marl, conglomerate; rare outcrops

Thickness. The thickness of the Mechit Formation in the type section is about 570 m. Probably it reaches up to 700-800 m at the traverse of the peak Mechit.

Palaeogene deposits north-west and north of Panagyurishte

The scarce outcrops of Palaeogene sediments north of Panagyurishte have been found first during geological mapping on the scale 1:25 000 (Чунев et al., 1963). They crop out inside the Sredna gora crystalline block in two separate localities: Kyoy dere west of the Panagyurski koloni resort, and on the road north of this resort and the Medet open mine. It should be mentioned that this publication was the first to report the presence of neptunian clastic dykes in Bulgaria. The description hereafter follows almost entirely the publication cited as far as both localities have been changed (and most of them disappeared) during the past forty years.

The Palaeogene in the locality Kyoy dere is preserved as small denudation pockets (the largest one followed on a distance of about 30 m) traced over a distance of nearly 450 m. The conglomerates cover with depositional contact the eroded surface of weathered hornblende-biotite gneisses, and in one of the outcrops cover also a dyke of dioritic porphyrite (supposed Late Cretaceous in age). Two clastic dykes (thickness 10-20 cm; strike NW — SE, dip $70-90^{\circ}\text{SW}$ and $55-90^{\circ}\text{NE}$, respectively) have been traced at distances of 7-10 m and at ca. 1-2 m in depth. The conglomerate consists of unsorted, different in size (from 135×63 cm to 1 mm) semi-rounded to rounded pebbles and terrigenous grains. Locally the conglomerate passes into coarse-grained sandstone. However, the bedding is hardly discernible. The pebbles usually are covered with a thin brownish crust. They are of variable composition, their provenance being both from the Sredna gora crystalline block and from the Upper Cretaceous Panagyurishte strip to the south. The pebbles from the immediate surrounding are most frequent: two-mica, biotite

and hornblende gneisses, as well as Late Cretaceous quartzdiorite and granodiorite (including such from the chilled margins). Some of the pebbles are impregnated with pyrite and chalcopyrite, and are similar to the porphyry-copper ored quartzmonzodiorites from the Medet deposit. Pyritized and epidotized quartz-dioritic and granodioritic porphyries from the Late Cretaceous dyke formation are frequent whereas pebbles from the Palaeozoic hornblende-biotite and two-mica granites are scarce. The matrix is scarce, and is usually of a contact type. Quartz and feldspar grains are cemented by a fine-grained sericite-chlorite mass. Hydrothermal alteration and pyritization follows late intersecting fractures. Locally the gneisses are upthrust on the conglomerate, and along the thrust surfaces both gneiss and conglomerate are hydrothermally altered and pyritized.

The outcrops north of the Medet porphyry-copper deposit are very small. In one outcrop the conglomerate covers the weathered surface of two-mica porphyry granite of the Late Carboniferous Koprivshitsa pluton. The other occurrence is a neptunian clastic dyke striking NW-SE and dipping 60°NE , with a thickness of 30-50 m and a length of about 5 m. The pebbles (1 mm — 20 cm, rarely up to 0.75 — 1 m) are represented by two-mica granite (similar to the host rock), chloritized gneiss, dioritic porphyrite, spessartite, etc. The matrix is scarce in amount, and is composed of quartz, K feldspar, plagioclase, muscovite, altered biotite and sericite.

Fossil content and age

No fossils have been found up to now, and the age has been assumed by wider correlations and general considerations. The present authors sampled along the path parallel to the river Strelchanska Louda Yana the finer-grained sediments (fine-grained sandstone, siltstone, shale) that contain coalified plant debris (including one thin bed of coal-bearing shale). All samples contain abundant plant debris, usually black and structureless. Two of the samples contain single light-coloured and transparent plant debris with clear cellular structure.

The following taxa (Table 1) have been determined by S. Chernyavska and P. Pavlishina (Zagorchev et al., 2001a) and Pavlishina (2002).

The conclusions of Pavlishina (2002) about the stratigraphic value of these taxa and their co-existence in the samples studied (the Mechit Formation, respectively) are as follows:

Table 1

Fossil content of the samples studied

(after P. Pavlishina; from Zagorchev et al., 2001^a and Pavlishina, 2002)

Taxa	M-1/2000	M-2/2000	M11/2000	7/99
<i>Nudopollis apertus</i> (Pflug) Pflug		+		+
<i>Nudopollis thiergartii</i> (R.Potonie) Pflug		+		+
<i>Oculopollis minoris</i> W.Krutzsch	+	+	+	
<i>Oculopollis extensus</i> Weiland & Krieg		+		
<i>Trudopollis hojrupensis</i> Kedves			+	+
<i>Trudopollis arector</i> Pflug		+	+	
<i>Semioculopollis croxtoniae</i> Kedves	+	+		
<i>Interporopollenites</i> fspp	+	+		+
<i>Milfordia incerta</i> (Th. & Pflug)				+
<i>Plicapollis silicatus</i> Pflug	+			+
<i>Talassiphora pelagica</i> Eisenack			+	

“The stratigraphic value of the discussed Normapolles species as well as the age assessment of the whole assemblage is based on calibration of the stratigraphic range of the taxa within the Normapolles province and especially in the type Maastrichtian and Danian sections. Although poor, the assemblage contains good elements for correlation.”

“The palynological assemblage ... is charac-

terized by the consistent occurrence of *Nudopollis apertus*, *Nudopollis thiergartii*, *Oculopollis minoris*, *Semioculopollis croxtoniae* and *Interporopollenites* spp. Most of the encountered species in it are known from the latest Cretaceous to the Middle Paleocene. Namely *Nudopollis apertus*, *N. thiergartii*, *Oculopollis minoris* and *O. extensus* range from Maastrichtian to Middle Paleocene,

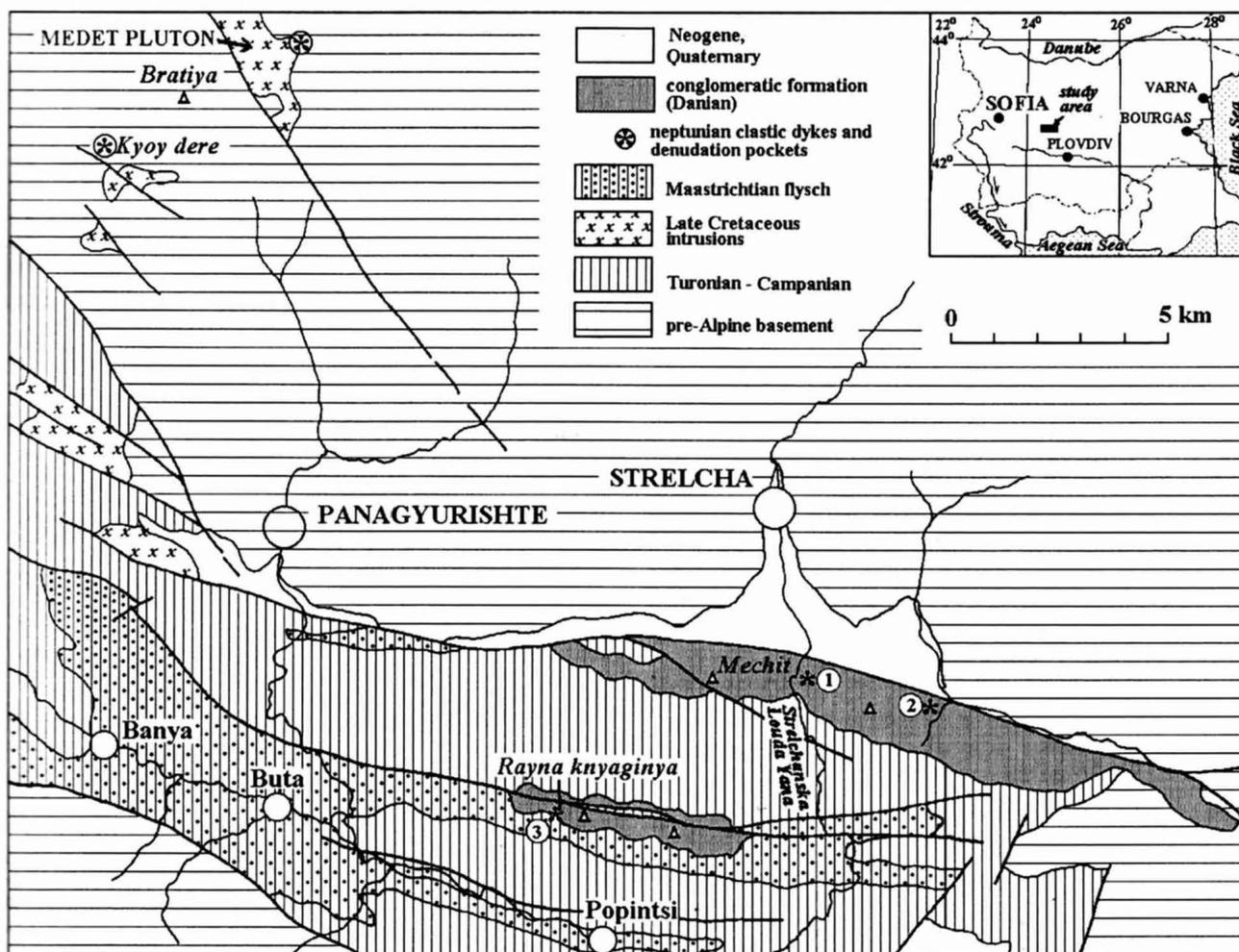


Fig. 1. Generalized geological map for the location of the Palaeogene sediments in the Panagyurishte and Strelcha areas. After Zagorchev et al. (1963; unpublished report and map 1:25 000) and Илиев, Кацков (1990); with revision

PLATE I

Field photographs from the reference section Rayna knyaginya

- 1 – polymictic conglomerate near the ridge (packet 3); detail from 2
- 2 – conglomerates with sandstone interbeds; packet 3 near the ridge
- 3 – sandstones interbedded with conglomerates (packet 2) with samples M1 and M2; spring and fountain Rayna knyaginya
- 4 – Maastrichtian epiclastics (bottom right) covered by coarse polymictic conglomerates (denudation pocket) and well bedded conglomerates and sandstones; packet 1, basal parts of the section

Semiculopollis croxtoniae and *Trudopollis hojrupensis* are restricted to the Maastrichtian – Danian interval. The concurrent ranges of these taxa suggests a latest Maastrichtian to early Paleocene (most probably Danian) age for the conglomeratic formation. This age as-

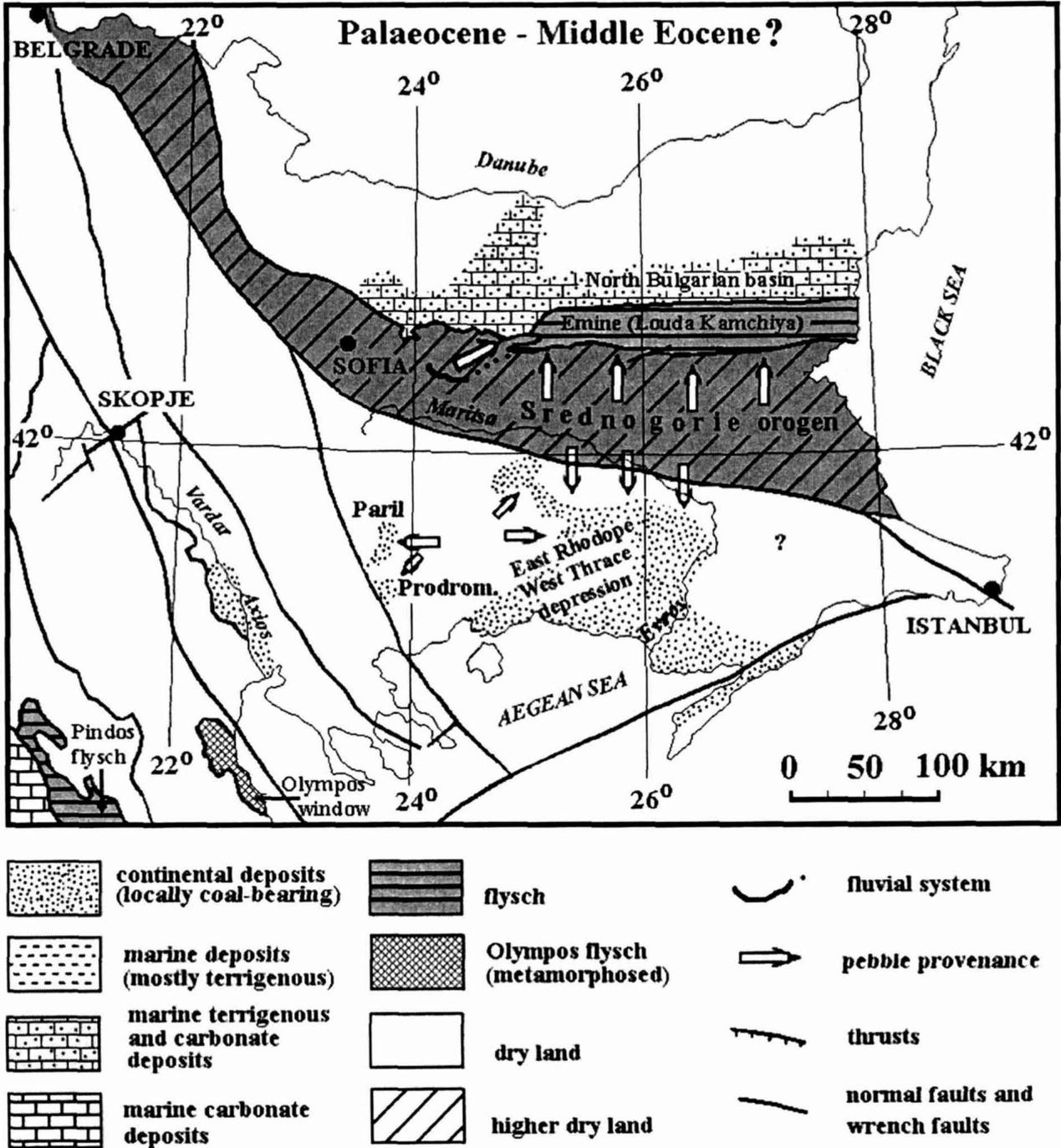
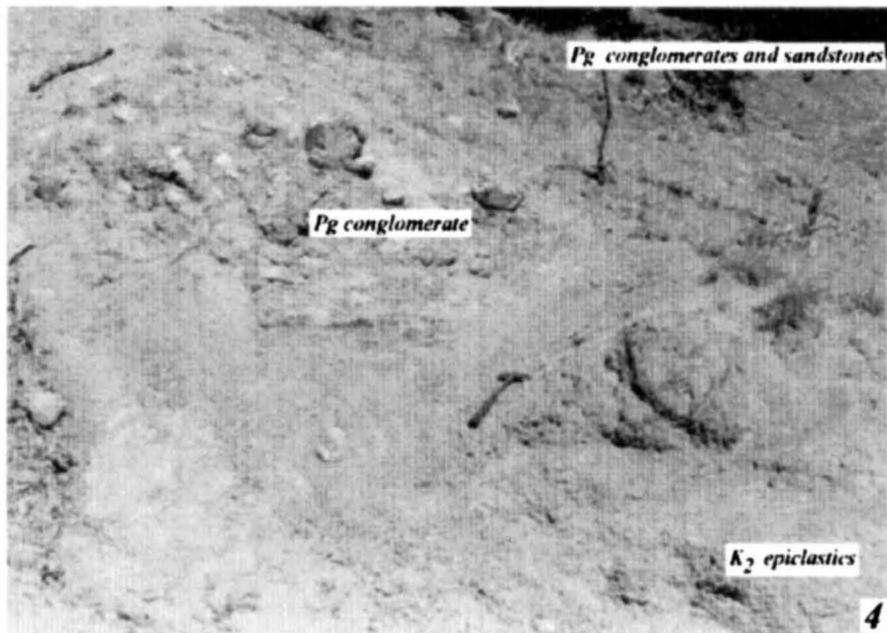


Fig. 2. Early Palaeocene palaeogeography in parts of the Balkan Peninsula (without palinspastics). Modified after Zagorchev (1996)

PLATE I



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assessment is well supported by the presence of the dinocyst species *Thalassiphora pelagica* Eisenack in sample M-11/2000. The first occurrence of this characteristic species is very well documented in the uppermost Maastrichtian in Denmark (Hansen, 1977)."

Correlations and conclusions

The newly-introduced Mecht Formation (uppermost Maastrichtian — Lower Danian) is built of coarse sediments correlated throughout the three distinct outcrop areas (Fig. 1) on the base of the similar composition (both of matrix and pebbles). The age has been determined by taxa of the Normapolles group (Pavlishina and Cernjavaska in Zagorchev et al., 2001a; Pavlishina, 2002). The sediments in Kyouy dere are slightly coarser, less sorted, and contain a smaller percentage of pebbles from the Late Cretaceous igneous rocks, and bigger amount of pebbles from gneisses and amphibolites that crop out in the immediate surroundings. The formation is correlated with the marine conglomeratic formation beneath the Botev vruch thrust sheet (Zagorchev et al., 2001b) dated as uppermost Maastrichtian — Danian on the basis of calcareous nannofossils and foraminifers. The whole setting suggests the formation and evolution of a fluvial system that has drained the low-mountain area of the Srednogorie orogen. The fluvial system formed in an extensional normal-faulting environment, and locally could create ponds or boggy areas with coal. The drainage was directed finally towards north and east (Fig. 2) where the waters with the sand and gravel entered the shallow parts of the marine basin (now beneath the Botev vruch thrust sheet — Zagorchev et al., 2001b) — probably a gulf from the Emine flysch trough of the same age.

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Палеогенски седиментни наслаги (Мечитска свита) при градовете Панагюрище и Стрелча (Средна гора)

И. Боянов, И. Загорчев, А. Горанов

(р е з ю м е)

Име. Мечитската свита е наименувана по вр. Мечит (южно от гр. Стрелча, западно от типовия разрез).

Определящи белези. Мечитската свита се състои от груби теригенни континентални седименти: конгломерати, прослоени от пясъчници и (рядко) въгленосни алевролити. Съставът на късовете в конгломератите отговаря на 1) състава на фундамента на Средногорската зона, разкрит главно в Средногорския кристалинен блок: докамбрийски двуслюдени, биотитови и амфиболони гнайси, амфиболити, палеозойски амфибол-биотитови, биотитови и двуслюдени гранити, пегматити и кварц, както и къснокредни интрузивни и дайкови скали и дайки и свързани с тях орудявания; 2) състава на къснокредната Средногорска зона: къснокредни андезити, дацити и трахити, кварцдиорити, гранодиорити и монцо-

нити, туфи, пясъчници и мергели. Скалите на свитата изграждат неправилни пластове. В рамките на Средногорския кристалинен блок изграждат денудационни джобове и нептунични кластични дайки.

Историческа справка. Мечитската свита е отделена за първи път като палеогенски (предполагам среден еоцен) наслаги, разположени несъгласно върху горнокредния разрез, от Христов (1960). Чунев и др. (1963) предполагат горнокредна възраст и описват дотогава неизвестните разкрития в денудационни джобове и нептунични кластични дайки (Къой дере, Медет). Димитрова и др. (1984) предполагат мастрихтска възраст, а Аладжова-Хрисчева и др. (1991) — лютеска възраст, като отнасят тези седименти към морската Старопатишка свита. Zagorchev et al. (2001) описват Мечитската свита като конгломератна задруга с флувиален произход и горномастрихтско-данска възраст.

Типов и допълнителен разрез. Типовият разрез е разположен по долината на р. Стрелчанска Луда Яна южно от гр. Стрелча. Допълнителен разрез е изследван при извора Райна княгиня северно от с. Попинци.

Възраст. Възрастта на Мечитската свита е определена от Zagorchev et al. (2001) като най-горен мастрихт — дан. Основание за това дават определенията от С. Чернявска и П. Павлишина (Zagorchev et al., 2001; Pavlishina, 2002) палиноморфи от групата *Normapolles*.

Разпространение, взаимоотношения с други скали, латерални изменения, палеогеография.

Мечитската свита покрива с несъгласен размирен контакт всички допалеогенски скали на Средногорската зона, които се разкриват в местата на нейното разпространение: горнокредните скали на Панагюрската ивица от Средногорieto, както и докамбрийски метаморфити и палеозойски гранитоиди. Конгломератите на свитата съдържат късове от всички горнокредни скални разновидности (включително от интрузивни скали), както и от докамбрийски метаморфити и палеозойски гранитоиди. Свитата е разпространена само в две ивици (Мечитска и Попинска) южно от градовете Панагюрище и Стрелча, както и като денудационни джобове и нептунични кластични дайки в местн. Къой дере и при рудник „Медет“ (второто разкритие вероятно е унищожено при разширяване на пътя през последните 30 години). Късовете в конгломератите на свитата произхождат в северните разкрития само от най-близкото обкръжение на разкритията, докато в двете ивици показват разнообразен състав и относително по-отдалечени източници. Предполагаме, че всички установени разкрития са част от речна (флувиална) система, която е дренирала части от бързо денудирания се къснокреден Средногорски ороген. Водите и твърдият отток са се отправяли към горномастрихтско?-данския морски залив от Еминския флишки трог. Понастоящем груби отложения със същата възраст и разнообразен късов състав при подхранване от Старопланинската зона и Средногорieto се разкриват под Старопланинския гранитен навлак (Zagorchev et al., 2001b).