RESEARCH PAPER | Geography | Volume : 5 | Issue : 9 | September 2015 | ISSN - 2249-555X

GEOMORPHOLOGICAL DEVELOPMENT OF DRAGOEVO MOUNTAIN

KEYWORDS: Leveled surfaces, River terraces, Geomorphological stages.

Assoc. Prof. Dimitar Todorov Vladev PhD

Konstantin Preslavsky University of Shumen, Faculty of Sciences, Department of Geography, Bulgaria

ABSTRACT *A geomorphological research defines the boundaries of Dragoevo Mountain and gives a detailed description of the geomorphological peculiarities, geologo-tectonic and geophysical characteristics of the mountain. The morphogenesis of Dragoevo Mountain has been clarified through an analysis of the horizontal and vertical segmentation of the relief, the morphometry and the location of the denuding surfaces and river terraces. The final part deals with the periods of the geomorphological evolution of Dragoevo Mountain on the basis systematic scientific information.*

Dragoevo Mountain is an integral part of the low mountainous lands of the Eastern Northern Balkan of the Republic of Bulgaria. In almost all geological-morphological research this mountain has been closely linked with Preslav Mountain. Despite some similarities between these twin mountains there are a number of differences which is a reason enough to look upon them as separate mountains. There are very few geomorphological researches on Dragoevo Mountain, most of them concerning concrete issues, which predetermines the carrying-out of a new geomorphological investigation of the mountain.

Morphological characteristics

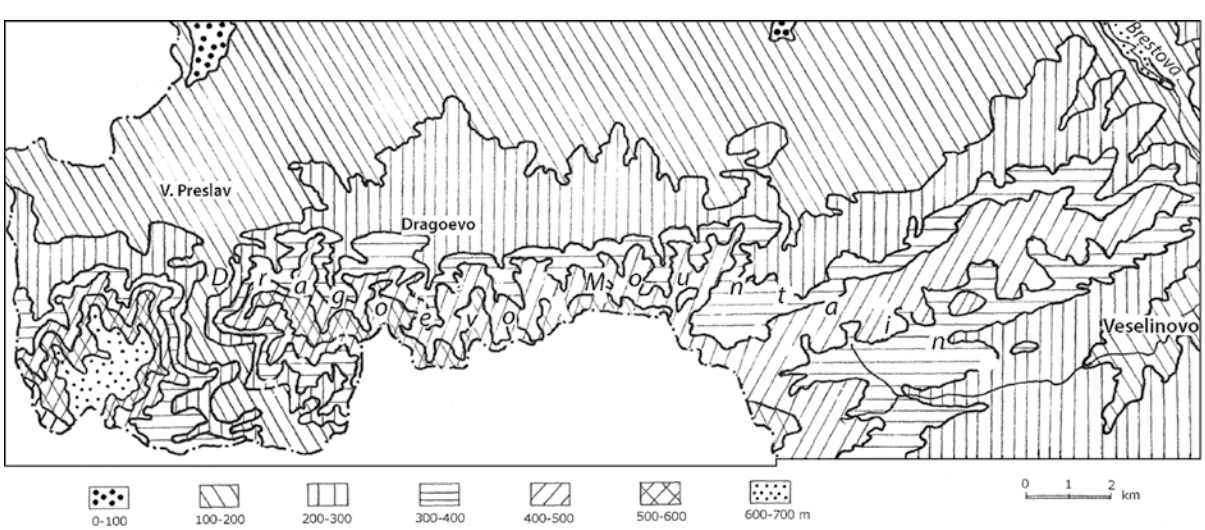
Dragoevo Mountain is part of a north-west south-east situated range whose relief is a well-formed chain mountain.

In older scientific researches the mountain was noted as Dervish Mountain, Dervish Balkan, Dragoiska Mountain (Koen, 1933) and Dradoevo Mountain. Its last name is after the name of a big village situated north of the highest peak – Otaka (609 m).

The borders of Dragoevo Mountain are marked: to the northwest by the Preslav gorge (Dervena, 12 km long and a cutting of up to 550 m) which separates it from Preslav Mountain; to the north northeast by Shumen-Smyadovo substructural decline; to the south- southeast by Varbitsa Mountain and Rish structural-erosive decline (it is separated by the Veselinovo gorge of the Brestova River – 5 km long with a cutting of up to 350 m) and to the southeast by Gerlovo structural decline. Within the stated borders Dragoevo Mountain is about 25 km long northwest to southeast and its width varies from 3-4 km in the northwest to 8-9 km in its central part decreasing to 2.5-3 km in its eastern part. The total area of Dragoevo Mountain, calculated from a large scale topographic map (S: 1: 25 000) is about 122.1 km^2.

Watching the highest part of the mountain one will notice that the ridge is flat, slightly inclined from the north-west to the south-east with a mean latitude of 500-600 m. In a hypsometric respect the territory of the mountain could be classified as hilly and low mountain (Fig.1). Dragoevo Mountain is lower than Preslav Mountain and in the southeast it gradually turns into a typical hilly-knolly area. The main direction of Dragoevo Mountain is slanting from the north-west to the south-east, while that of Preslav Mountain is almost sub-parallel. In its south-eastern part (in the direction north-south) Dragoevo Mountain is quite wider, decreasing its altitude in the direction of the Brestova River gorge.

Fig. 1. Map of the latitudinal belts in the region of Dragoevo Mountain



Volume : 5 | Issue : 9 | September 2015 | ISSN - 2249-555X

The longest rivers rising from Dragoevo Mountain are the Zlatarska River (18 km long, with its tributaries the Brashlyanovska River and the Kasi dol River). The Dolnik River (12.65 km long, with a spring the Dragoevska River) and the Brestova River 9it rises west of Rishki pass at a latitude of 430 m and 30 km long). After the Preslav gorge the Golyama Kamchiya River makes a semi-circle with a radius of 9 km, whose axis between the towns of Preslav and Smyadovo is parallel to the chain southern fence – Dragoevo Mountain. The only significant left mountain tributary in this region is the Dervisha River (5.6 km). 4 km north of the town of Preslav the Dolnik River, rising from under Mogilata peak (490 m), flows into the Golyama Kamchiya River. It runs transversely to the mountain slope, forming a typical ruse. Other big rivers in this region are: the Chaladere (9.75 km long with a mean altitude of the water collection basin of 382.3 m); the Ilandere (4.75 km long up to the dam), which after the dam (0.675 km long) is named the Kalugera (the Monk) (3.625 km long; the Skolomenska River (4.25 km long; the Krivenski dol (5 km long; the Smyadovska River (4.25 km long) and so on.

Representative quantitative characteristics of the relief forms give the values of the horizontal, vertical segmentation and the real declinations within the borders of Dragoevo Mountain.

The lowest values of the horizontal relief segmentation (0.5-1 km/km^2) have been established along the ridge of Dragoevo Mountain, the leveled repere surfaces and right after the bend of the mountain slope. The values increase (more than 2 km/km^2) along the steep slopes of the mountain and the ridges, marking the eastern border of Gerlovo declination Fig.2).

Minimal values of a vertical segmentation of the relief (50-100 m/km^2) have been established along the ridge, the watershed parts and the low bend of the slope. In the hypsometric interval of 300 to 500 m the values are bigger (200-250 m/km^2), reaching their maximum (300-350 m/km^2) on the northern slopes, descending towards Shumen-Smyadovo substructural declination (Fig. 3).

Fig.2. Horizontal segmentation of the relief in the region of Dragoevo Mountain

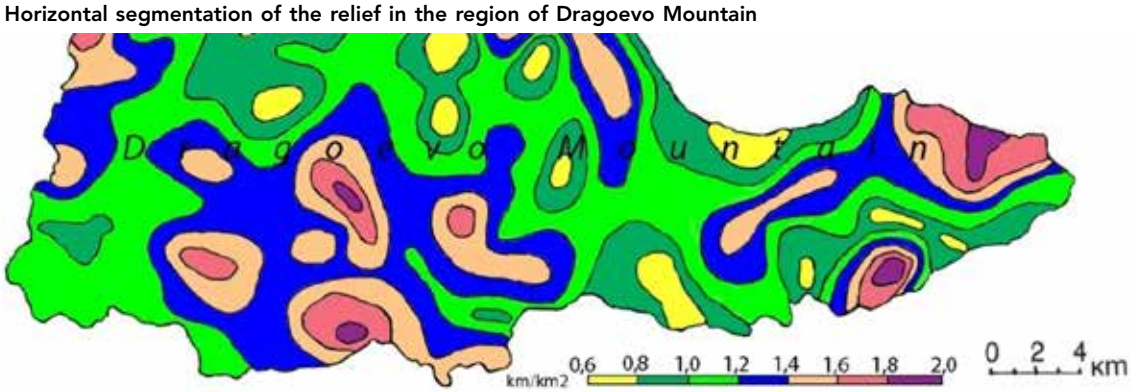
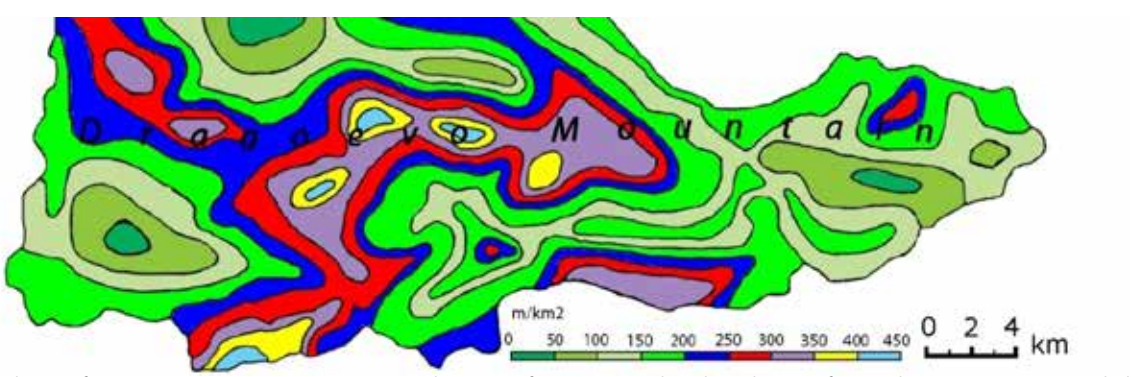


Fig. 3. Vertical segmentation of the relief of Dragoevo Mountain



The inclines of Dragoevo Mountain vary in a wide range–from 3-5° on the denuding surfaces, the river terraces and the mountain ridge to over 50° along the southern and north-northeastern structurally predeponed slope of the mountain.

Analysis of the geological-tectonic data

The available geological information on Dragoevo Mountain has been systemized in Geological map of Bulgaria in Scale 1:100000 (cardboard sheet Shumen – Cheshitev, Nedyalkova, 1995; c.s. Provadiya – Milanova, Cheshitev, 1992).

Dragoevo Mountain is conforming to the Preslav anticlinale. The latter was noted in the past as two separate anticlinales– Predjanska in the north (Kockel, 1927), with an axis passing through the village of Predja– the town of Smyadovo-the village of Dragoevo –Preslav Mountain and Aspaukhovska (Ackermann, 1932) in the south, developed in the direction of the Luda Kamchiya River.

Volume : 5 | Issue : 9 | September 2015 | ISSN - 2249-555X

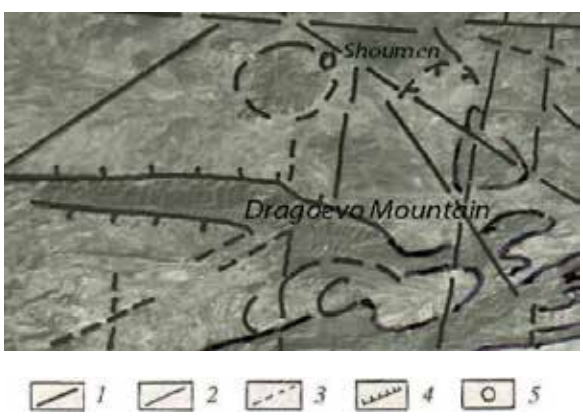
Two secondary compound anticlinale folds have been discovered in the Preslav anticlinale, the southern one being like a suitcase handle.

Ek. Bonchev et al (1957) characterizes it as tumor brahianticlinale with a big vertical subsidence between the hinge and its northern edge. Its western periclinale is divided by a wedge-like, closed to the east, comb filled with hotriv marls, while the eastern one is marked by the valange in the valley of the Kalandere River. North of the village of Veselinovo the structure consists mainly of sediments of hotriv. Yaranov (1960) notes that the Preslav anticlinale could be traced as far as the Veselinovska River, while it gets lost in the east and should not be connected with the Asparukhovska anticlinale.

The structure defining element in the north-northeastern part of Dragoevo Mountain is the North Balkan lineament. It was here that Dragoevo block-mount was formed as the significant depression from the southeast probably helped the noticeable folding of the front of the mountain.

In decoding photos from space of the region north-northeast of Dragoevo Mountain (obtained from ISZ-ERTS-1) it is evident that there is a border lineament and a mount. North of Dragoevo Mountain have been decoded two parallel regional lineaments with a direction north-sourh and east and south – regional lineaments with different directions (Fig.4).

Fig. 4. Decoding scheme of the tectonic structures in the region of Dragoevo Mountain



1-Transregional lineaments; 2-Reginal lineaments; 3- Local lineaments; 4 – Lineaments with positive character; 5 – Circular lineaments (KFS-ERTS-1, USA)

The surface rocks in Dragoevo Mountain are of upper Jurassic-lower Cretaceous age. These are marls and loamy limestones with layers of sandstones (Ticha fold–1200-1300 m thick), replaced in the south-southeast by sandstones and marls (Kamchiya fold – 800-1000 m thick). Dragoevo Mountain has a transition type valange– between the limestone in Northeastern Bulgaria and the fleecy type in the Northern Balkan. The above-mentioned rocky complexes have been piled in the northeast over the hotriv-aptic marls and loamy marls (Gorna Oryahovitza fold 250-1000 m thick) building up the bed of Shumen-Smyadovo substructural declination (Geol. Map of Bulgaria, S 1:100 000, c.s. Shumen and c.s. Provadiya).

Current vertical movements of the earth crust within the limits of Dragoevo Mountain are between +0,8 to +1,1 mm/annually (Totomanov, Vrablyanski, 1980).

Geomorphological characteristics

The geomorphological development of Dragoevo Mountain during the neogen-quarter period could be traced on the surface through the quantity and direction of overlapping of the denuding surfaces and the river terraces (Fig. 5).

As in Preslav Mountain the highest and the oldest is *the initial (Sarmatian-Pontian) surface* which can be seen along the ridge of Dragoevo Mountain at an altitude of 530 m in

the northwest to 450 m in the southeast. These places are discordant to the valange and in the southeast to the hotriv layers. It is dominated by the peaks Karaburun (576 m), Slanik (559.1 m), Otaka (609 m), Mogilata (565 m), Lalkova Mogila (598.4 m) and Chengelski Grob (542.7 m).

The Sarmatian-Pontian surface could be traced in the form on linear fragments, displaced and fragmented by the tributary valleys of the rivers Dolnik and Zlatarska.

In the east the exit flatness decreases to 480-450m, comfornly displaced to the Veselinovo gorge. In this way between the rivers Ilandere and Brestova were fixed two parallel stripes: one – along the axis of the Preslav anticlinale around the remnant heights of Kadanata peak (491.3 m), elevation 499.9 m, Lopuvska mogila peak (529.1 m) and elevation 465.2 m; the other one – along the watershed flatness of Drebova chuka (504.7 m) to the south, over elevations 480.4 m and 465.9 m, along the ridges over the tributaries of the Brestova River, the massive Gorunov crest (464.1 m), the crown of Kitkata ridge (466.6 m) to elevation 407.4 m at the beginning of the Veselinovo gorge. To the north this flatness is connected to the central crest of Dragoevo Mountain, Drebova chucka peak (504.7 m) and elevation 480.4 m.

The second highest flatness – the Villafrank (the Pleistoscene) covers in fact two flat ridge surfaces. At the northern foothills of Dragoevo Mountain these layers are interconnected at an altitude of 150 to 250 m. The second level has the greatest areal development in the lower part of the slope of Dragoevo Mountain – along the flat watershed flatnesses situated at 180-220 m. South of the town of Veliki Preslav in the direction of Dragoevo Montainthe surface is limited by the valleys of the rivers Dervisha and Dolnik. To the northeast in the direction of the villages of Zlatar, Suha reka and Salmanovo this level is flat-hilly with a displacement of 30 to 70 m. In the southern periphery of Dragoevo Mountain the Villafrank levels are situated in floors, the upper one being covered with an accumulative gravel-clayey layer with a thickness of 5 to 10 m. The front batter is about 50 m high.

During the Pleistoscene there was a rapid development of *river valleys* on the slopes of Dragoevo Mountain.

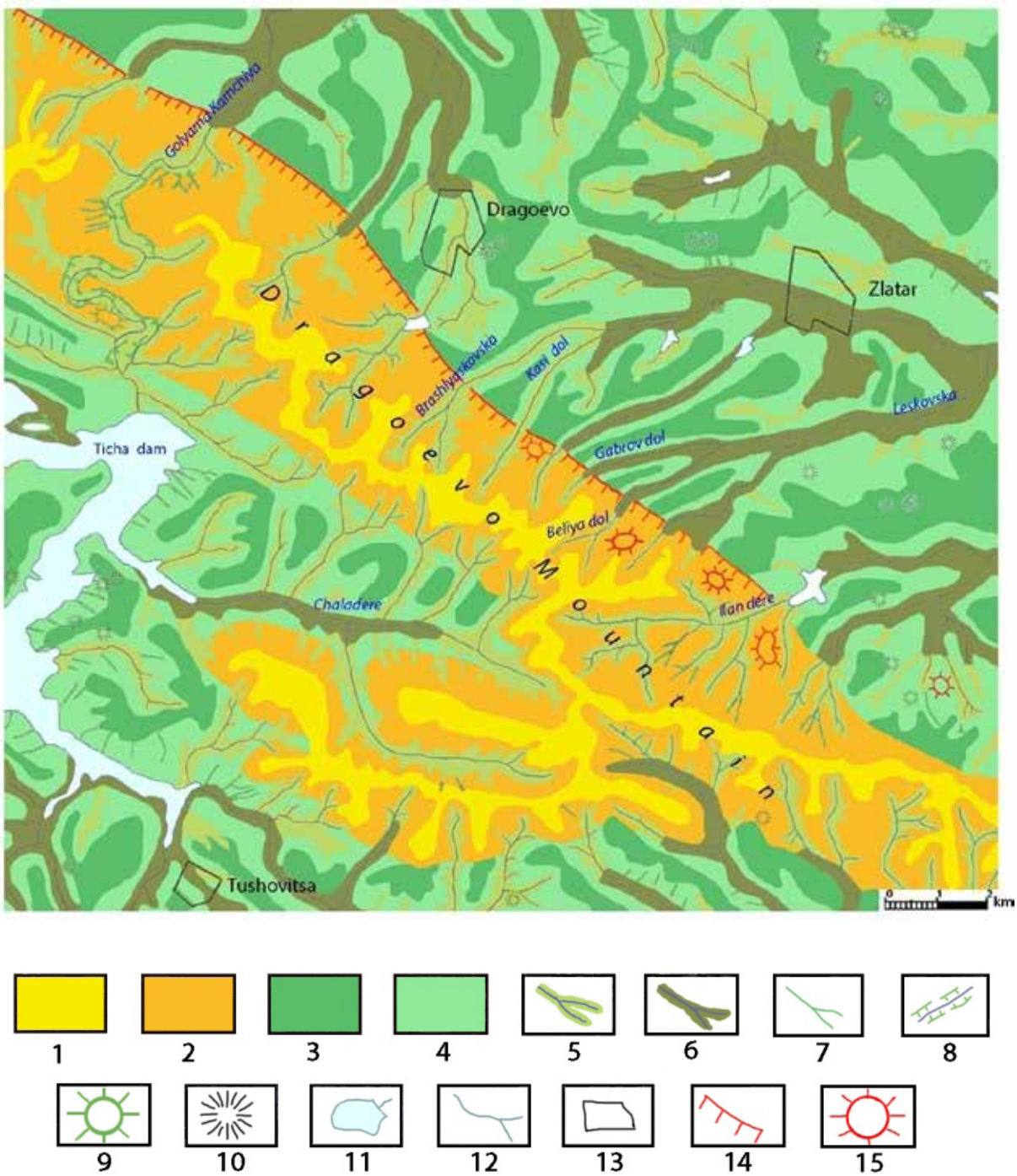
Some of the first scientists who did a relatively detailed research on the gorges of Dragoevo Mountain were St. Bonchev (1933) and El. Koen (1937). St. Bonchev assumed that the gorges were formed during the Mioscene and the early Quarternary along "*transverse cracks through the anticlinales*".

High non-floodable terraces can be found at the exit of the Preslav gorge (at 80 m), along the banks of the Smydovska River (at 65-70 m) and the Zlatarska River.

Mid-altitude and low non-floodable terraces on the steep slopes of Dragoevo Mountain can hardly be found.

Volume : 5 | Issue : 9 | September 2015 | ISSN - 2249-555X

Fig. 5. Geomorphological map-scheme of Dragoevo Mountain region



1 – Sarmatian-Pontian denuding surface (primary peneplain); 2 – steep slopes (paleogen -holocen); 3 – Villafrank surface (plio-pleistocen); 4 – low angle slopes (pliopleistocen - holocen); 5 – ravines and valleys; 6 – flood river terraces (alluvial pilings); 7 – ravine erosion along the slope; 8 – gorge valley; 9 - bypass hill; 10 – mound; 11 - artificial reservoir; 12 – river (flow); 13 – settlement; 14 - fossilized fault with them riding; 15 - structural erosion hill.

High non-floodable terraces can be found at the exit of the Preslav gorge (at 80 m), along the banks of the Smydovska River (at 65-70 m) and the Zlatarska River.

Mid-altitude and low non-floodable terraces on the steep slopes of Dragoevo Mountain can hardly be found.

Wide up to 1-2 km floodable terraces exist along the valley of the Golyama Kamchiya River, right after the Preslav gorge as

Volume : 5 | Issue : 9 | September 2015 | ISSN - 2249-555X

well as at the place of entry of the Leskovska and Selskata (Zlatarska) Rivers. The floodable terraces on the mountain slopes, if any, are extremely narrow, almost without any alluvial covering.

Genesis and main epochs of the relief development

The geomorphological analysis enables us to define the following epochs in the geomorphological development of Dragoevo Mountain:

Pre-neogenic epochphase. At the beginning of upper Cretaceous period (Cenomanian-Turonian) was dry land. The lack of surface chalk rocks and the overlapping (by fault) of Oxford-valange marls and loamy limestones (Ticha fold) on hotriv-apt rocks (Gorna Oryahovitza fold) in the western part is evidence that the foundation of Dragoevo Mountain was laid during that period. In the southeastern part there are only hotriv sandstones and marls (Kamchiya fold) which supposes a smaller amplitude of the overlapping that turned only into fold-forming. The sinking of the southeastern part was probably due to a fault that later on defined the direction of the Brestova River. To the west, the relative detachment of the Dragoevo block is defined by the fault which was the reason for the forming of the preslav gorge. The rising of the Dragoevo block was most intensive during the Eocene-Oligocene (Illyrian and Perinian tectonic phases).

Neogenic epoch. The rising Dragoevo block was subjected to a continuous denuding. By the end of the Oligocene- upper Miocene the initial (Sarmatian-Pontian) flatness was already formed. Its traces can be found in the ridge parts of the mountain in the form of a narrow stripe decreasing its hypsometry in the east at an altitude of 530 to 450 m. At the transition period to the Quarternary, as a result of the tectonic activity, were formed up to two Pleo-Pleistocene slope steps at an altitude of 150 to 250 m.

Quarternary epoch. The rising of Dragoevo Mountain is accompanied by the continuous sinking of the Black Sea pan which dragged the eastern parts of the mountain. The changes of climate, the repeated change in the erosive basis of the Black Sea and the slow tectonic movements led to the formation of non-floodable, and during the Holocene of floodable river terraces.

REFERENCE Bonchev, Ek. et al, 1957. Some Issues on the Tectonics of the Eastern part of the Balkan Peninsula in Connection with the Tectonic Problem of the Black Sea. Bul. MOIP, Geol. Sec., 32, 6, pp, 13-21. | Bonchev, St. 1933. On the Origin of Some Transverse Valleys within the Balkans, Newsletters of the BGS, 1. | Koen, El. 1933. Geology of Dervent-Derviska (Eski-Djumaya-Preslav) Mountain. Journal of the Bulgarian Geological Society, V, 2, pp. 131-159. | Koen, El. 1937, Antecedent of the Valleys of the Rivers Vrana and Golyama Kamchiya within the Boundaries of the Preslav Fold System - Newsletters of the BGS 5, 1937. | Milanova, V., G. Cheshitev, 1992. Geological Map of Bulgaria in S:1:100 000, c.s.Provadiya. Committee of Geology and Mineral Resour-ces, Geology and Geophysics, PLC, S. p. 30. | Totomanov, I., B. Vrablyanski, 1980. Current Vertical Movements of the Earth Crust in Bulgaria and the Contiguous Land - In: Geodynamics of the Balkans. S. Technics, pp. 138-149. | Cheshitev,G., L. NedyalkovaKKK. 1995. Some Notes on the Geological Map of Bulgaria in S: 1:100 000, c,s, Shumen, Committee of Geology and Mineral Resources, Geology and Geophysics, PLC, S. p. 49. | Yaranov,D. 1960. Tectonics of Bulgaria. S. Technics, pp.136-145.