

Geomorphological Features Of Ludogorsko Plateau

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ABSTRACT:- The work deals with the geomorphological characteristics of the Ludogorsko Plateau. It gives information about the geography, relief, rocks and soil. Special attention has been paid to the borders, morphology, hydrography, the surface rocks, geomorphological characteristics (flat surfaces and river terraces) and the manifestation of the exogenic processes. The analysis made it possible to draw conclusions about the morphological development of the Ludogorets Plateau in the final part of the paper.

Keywords: morphology, rock, tectonics, leveled surfaces, river terraces, geomorphological stages.

The **Ludogorska sub-region** includes the Ludogorsko Plateau - a vast, undulant, and deeply cut plateau-like part with a gradient mainly in the north. It is situated east of Beli Lom and north of the Popovsko-Razgradski and the Samuilovski Heights. The bigger rivers running through the Ludogorie spring near the main watershed for Northeastern Bulgaria, forming a fan, make their way northward to the river Danube. In their upper and middle courses they indent significantly in the loess, Quaternary and Tertiary limestone forming deep dry valleys.

Borders and morphohydrography

The borders of Ludogorsko Plateau are defined as follows: to the west by the valleys of the rivers Beli Lom (a tributary of Rusenski Lom) and Topchiiska River (a dry valley in the direction of the Danube); to the south by the Razgrad and Samuil Heights; to the south-east by the valley of the Brestashka River (a tributary of the Karamandere); to the east by the Dobrudja Plateau; to the north the plateau gradually descends to the Ludogorie hilly historic-geographical region. Within these borders Ludogorsko Plateau is 80-85 km long west-east and 35-40 km wide north-south. Its latitude increases from 200 m in the north to 300 m in the south. (Fig. 1)

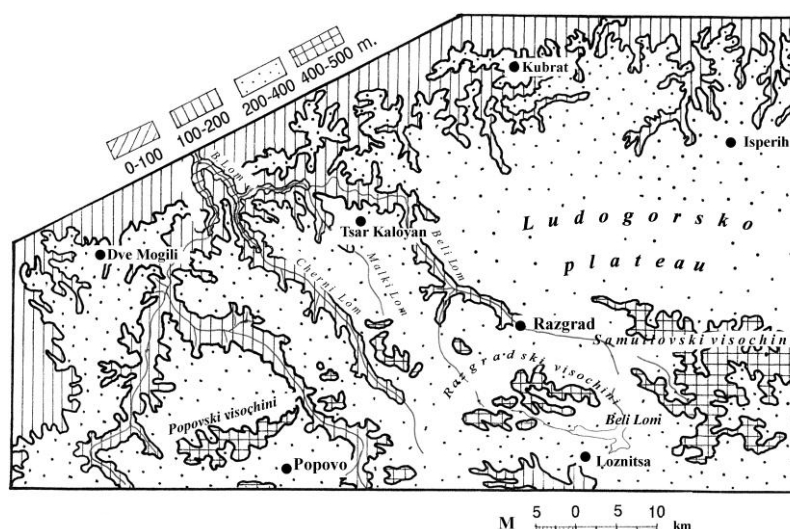


Fig.1. Hypsometric map of the Ludogorsko Plateau region

During the process of the tectonic rising the rivers flowing through: Topchiiska (water catchment area of 677.3 km²; river length of 82.4 km), Chairlak, Voina (water catchment area of 1080.3 km²; length of 104.4 km), Tsaratsar, Senkovets (water catchment area of 616.7 km²; length of 88.2 km) Kanagiyol (water

catchment area of 794 km²; length of 112.5 km) and Karamandere cut in forming canyons, which in their lower parts change into canyon-like dry calleys.

The horizontal segmentation of the relief is from 0.5 to 1 km/km² and the vertical segmentation is between 50 and 100 m/km². In river valleys and dry valleys the vertical segmentation reaches values of up to 150m/km². The prevailing slope gradients are from 3° to 10° (Galabov/editor-in-chief/, 1982).

Rocks and soils

Ludogorsko Plateau developed on the northern low-grade slope of the Northern-Bulgarian Rising. On the surface could be found Early Cretaceous limestones, lime sandstones and marls covered by loess, grey forest soils in the south and slimy and carbonate humus in the north. There are also deposits of apyrous clays and kaolin sandstones. Eolithic formations – loess, sandy loess and clay loess - are characteristic of this part of the country (Fig. 2).

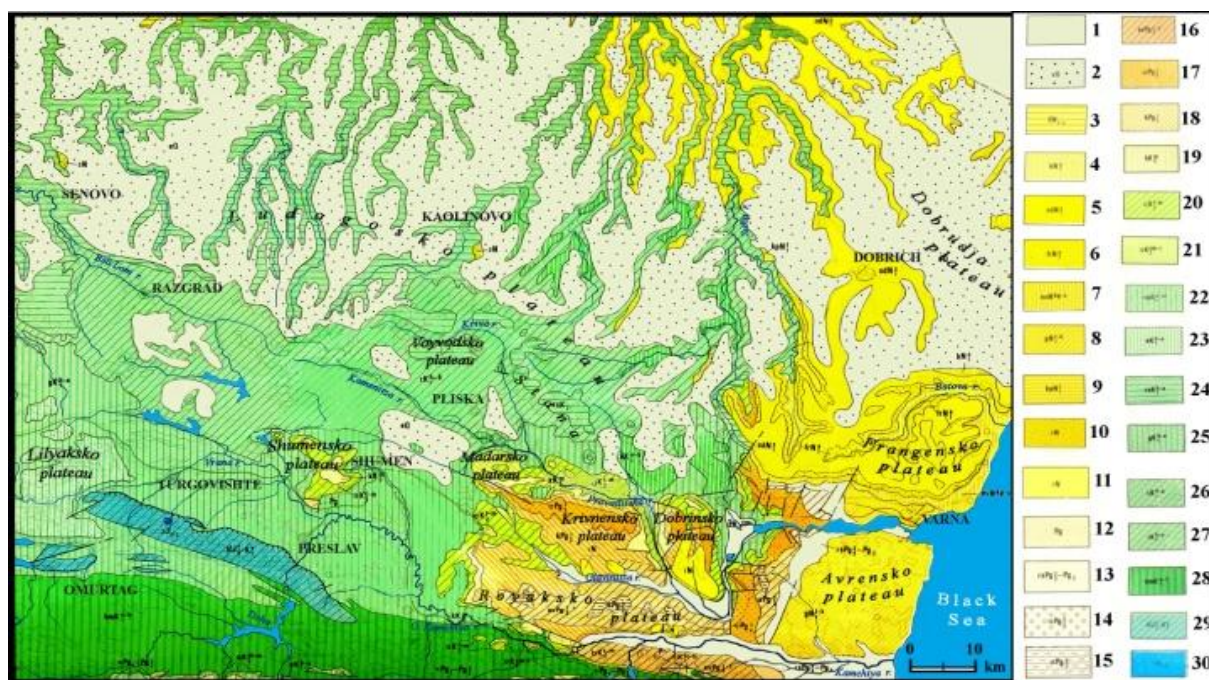


Fig.2. Geologic map of Northeastern Bulgaria /prepared by Geological map of Bulgaria, 1989/

1- Alluvial sediments /pebbles and sands of flood-plain and higher terraces/; beach terraces and beach sands; swamp deposits; 2- Eolian sediments /loess, sandy loess, clayey loess/; 3- Middle Pontian-Romanian, Silistra Group /glays sands, limes-tones/; 4- Middle-Upper Sarmatian, Karvuna Formation /mactra limes-tones/; in the area Balčik and Kavarna also Topolovo Formation/ banded clays and carbonates; 5- Middle Sarmatian, Odarci Formation /limestones/; 6- Lower-Middle Sarmatian, Frangja Formation /glays/; 7- Karaganian-Middle Sarmatian, Evksinograd Formation /glays/; 8- Tarkhanian-Konkian, Galata Formation /sands with clay interbeds/; west of Aksakovo-only Botevo Member /sandstones and limestones/; 9- Tarkhanian, Karapelit Formation /organogenic limestones/; 10- Undivided Miocene, Kaolin-sand formation; 11- Neogene terrigenous sediments /conglomerates sands and glays/; 12- Undivided Paleogene sediments /glayey sands, sands, limestones/; 13- Upper Eocene-Oligocene, Ruslar Formation /glays, marls, tuffs, manganese ores/; 14- Upper Eocene, Conglomerate formation /Exotic conglomerates /; 15- Upper Eocene, Detrital sandstone formation; 16- Middle-Upper Eocene, Avren Formation /marls, locally with interbeds of detrital sandstones/; 17- Lower Eocene, Beloslav Dikilitaš and Aladân Formation /glayey sands, sandstones and sands, nummulites limestones/; 18- Lower Eocene, Krivnja Formation /marls/, locally underlain by the sandstone formation; 19- Upper Cretaceous, Upper Maastrichtian, Kailâka Formation /limestones/; 20- Upper Turonian Maastrichtian, Terrigenos-carbonate rocks of Dobrina, Venčan and Šumen Formation – different combinations in different localities; 21- Cenomanian-Middle Turonian, Madara and Mogilata Formation /calcareous sandstones, silty limestones/, in Šumen plateau – only Madara, southwest of Markovo Vilage – only Mogilata Formation, sandstone formation in the East Fore-Balkan /Cenomanian/; 22- Lower Cretaceous, Aptian-Albian, Roman Formation /sandstones and marls/; 23- Barremian-Aptian, Elešnica Formation /Urgonian tupe limestones, conglomerates, sandstones, clays/; 24- Hauterivian-Aptien, Ruse Formation /limestones/, northeast of Todor Ikonomovo Village also the clayey limestone of Razgrad Formation; 25- Hauterivian-Aptien, Gorna Orijahovica Formation /marls and clayey, marls with sandstone interbeds/; 26- Clayey-limestone formation and in upwards

succession of sandstone, siltstone and clayey limestone formation on and para- Urganian formation; 27- Lower Cretaceous, Razgrad Formation /clayey limestones and marls/; 28- Valanginian-Hauterivian, Kamčija Formation /thick packets of sandstones and marls/; 29- Jurassic-Cretaceous, Tithonian- Valanginian, Tiča Formation / marls and clayey limestones/, 30- Middle-Jurassic, Shales, flysch /alternation of shales and sandstones/ with olistolites of Lower Jurassic and Triassic rocks.

Geomorphological characteristics

The geomorphological evolution of this part of Northeastern Bulgaria can be traced by the size and the characteristics of the denuding surfaces, river terraces and the manifestation of current morphogenetic processes (Fig.3,4).

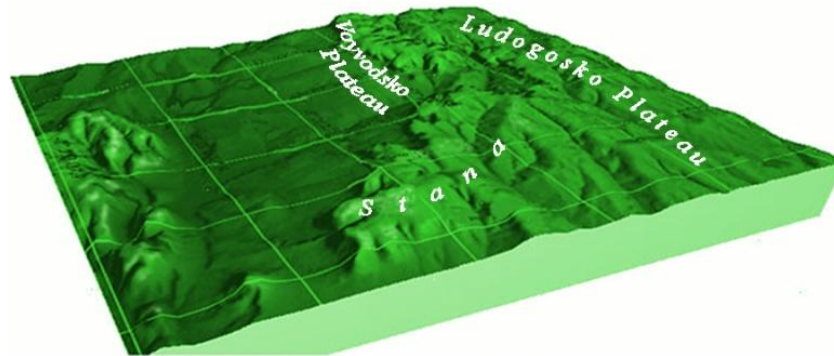


Fig.3. Model of the relief of the Ludogorsko plateau

Within the area of Ludogorsko Plateau, mainly in the chalk rock formation, are traces of the Early Micene denuding surface. The denuding flat is highly karstic, covered with loess and loess-like clays. Right under it at an altitude of 200-250 m can be seen fragments of a Plio-Pleistocene denuding-accumulative surface.



Fig.4. View from the Ludogorsko plateau

Because of the absence of a clear rock section the surface is difficult to detect in some places. During the Pliocene epoch the slow rise of Ludogorsko Plateau continued, accompanied by the cutting-in of the river network and the formation of unflodable river terraces.

During the Holocene period were formed the floodable river terraces, formed mainly from sands, gravel and clay link. In the dry valleys the thickness of the Holocene deposits is up to 8 m. (Philipov, Mikova, 1986).

Main periods in the geomorphological development of the Ludogorsko plateau

Late cretaceous-preeocenic stage. It was during this period that the southern frame of the big Provadijsko-Kamchijsko structural decline from west to east began building up, while at the same time there was a general rising along the line Novi Pazar-Vetrino (the region of the Ludogorsko plateau). During the transgressions the southernmost low parts of the North Bulgarian and Dobrdja swelling become part of an epicontinental sea basin (thickness of Late Cretaceous - 200-300 m).

Eocenic-oligocenic stage. There is a manifestation of the Iliric and Pyrenees folding phase, which influence the most significant changes in the relief of the studied territory and the parts around it. The western

border is marked by the Diagonal swell and the migration of the axis and the thickness of the sediments in the declines show the extent of the Tectonic movements.

Neogenic stage. There is a decrease in the endogenic activity while at the same time the role of the exogenic processes increases. The pediplens gradually changed and by Mud Miocene there was a clear initial surface (peneplains). Within the area of Ludogorsko Plateau are traces of the Early Micene denuding surface.

Plio-Pleistocenic stage. The relief developed under the influence of the Rhone and Wallachian Tectonic phases and fluctuations of the erosive basis of the Black Sea. The exogenic geodynamics is predetermined by the warm and wet climate, the main factor for the increase of the river flow. Along the Ludogorsko plateau slopes several slanting (often overlapping) level (steps) were formed.

Quarternary stage. The development of the relief is defined by the mutual influence of their Tectonic rising, the climate, the Eustatic fluctuations of the Black Sea basin and the cutting-in of the river valleys. During the Holocene period were formed the floodable river terraces. Significant expression have contemporary morphogenetic processes.

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