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MORPHOSTRUCTURAL RESEARCH OF THE ELENA HILLS

Abstract: The report represents the news received up to now from the investigation of the structural-geomorphologic specifics of Elena Hills. They represent a good determined fragment from the north-west margin of the Preslav morphostructural area (Fore Balkan morphostructural zone). The observed region is bordered from one segment of the south border of the South Moesian morphostructural zone northward; the Elena kettle morphostructure southward; Golyama Kamchiya river valley morphostructural westward and the Belitza river valley morphostructural eastward. The internal mosaic morphostructuiral pattern is composed by dome like morphounits from the Quaternary morphogeneration.

Keywords: Quaternary morphogeneration, mosaic morphostructural pattern, listric tectonics

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The topicality of the theme origin because absence of systematic regional geomorphological and morphostructural researches about Elena Hills, absence of contemporary morphotectonic concept for that region as and from unclear relations between East Fore Balkan and fence prime morphotectonic units.

Object of this research are Elena Hills within its geomorphological borders. It is researched the structure – geomorphological specific of one segment in the west periphery of Preslav morphostructural region. It is located in the east part of Fore Balkan morphostructural zone. As result of the already done detailed investigations in Elena morphostructural area has done attempt for collecting additional information about the role of neo- tectonic and contemporary movements of Earth crust in forming of contemporary morphological face in this part of Bulgaria.

Northward Elena (Alagyun) morphostructural region bounds with Ravno selo, Dolno Shivachevo and Bukak morphostructural region, south-westward with Badevo Morphostructural Region and southward with Elena Kettle Morphostructure (Fig 1). Westward it is outlined by Belitsa River- valley Morphostructure which it separates from Mazalat Morphostructure Region of Fore Balkan morphostructural zone. Eastward the researched morphounit is separated by Lisa Morphostructural Region with Stara reka River- valley Morphostructure. All these morphostructural elements represent a part of Preslav Morphostructural Area in Fore Balkan Morphostructural Zone [1]. The last one marks the border between South Moesian Continental Microplate northern and Bulgarian Continental Microplate southern (Fig 2).

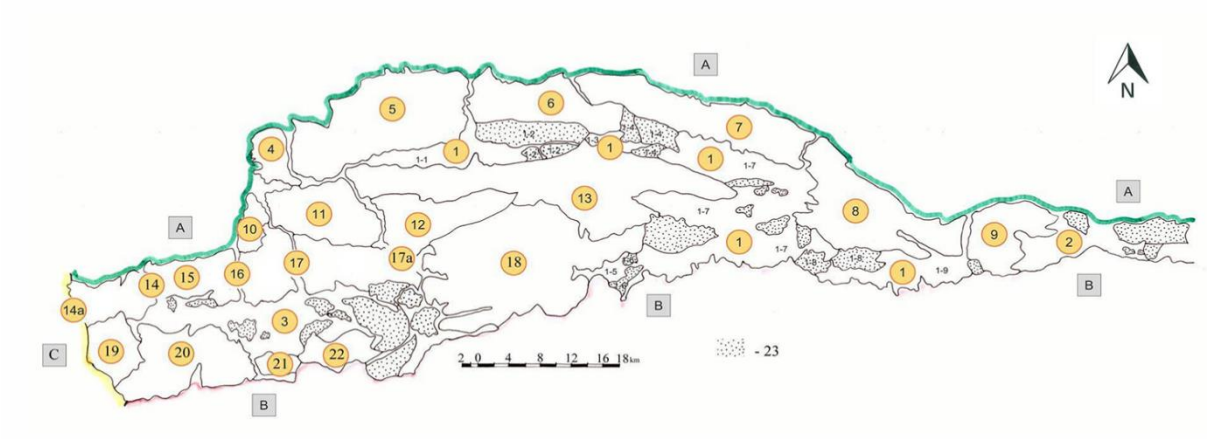

Fig 1 Overview map of the Preslav Morphostructural Area ([7] with additions)

Enclose morphostructures: A – South Moesian Morphostructural Zone; B – Udvoymatorievska and Primorska Morphostructural Area; C – Mazalat Morphostructural Area.

Regional morphounits: 1 – Ticha Complex Morphostructural Passage: 1-1 – Slannik Kettle Morphostructure, 1-2 – Panayot-Hitovo Morpostructural Threshold, 1-3 – Tupchileshtovo Kettle Morphostructure, 1-4 – Vardun Morpostructural Threshold, 1-5 – Filaretovo Kettle Morphostructure, 1-6 – Malko selo Morpostructural Threshold, 1-7 – Gerlovo Kettle Morphostructure, 1-8 – Byala reka Morpostructural Threshold, 1-9 – Aleksandrovo Kettle Morphostructure; 2 – Lopushna Kettle Morphostructure; 3 – Elena Kettle Morphostructure; 4 – Slivovitsa Morphostructural Region; 5 – Antonovo Morphostructural Region; 6 – Morava Morphostructural Region; 7 – Veliki Preslav Morphostructural Region; 8 – Dragoevo Morphostructural Region; 9 – Medovo Morphostructural Region; 10 – Ravno selo Morphostructural Region; 11 – Dolno shivschevo Morphostructural Region; 12 – Bukak Morphostructural Region; 13 – Omurtag Morphostructural Region; 14 – Veselinovo River- valley Morphostructure; 14a – Belitsa River- valley Morphostructure; 15 – Alagyun Morphostructural Region; 16 – Zlataritsa River- valley Morphostructure; 17 – Bebrovo River- valley Morphostructure; 18 – Lisa Morphostructural Region; 19 – Badevo Morphostructural Region; 20 – Todyuvo Morphostructural Region; 21 – Buynovo Morphostructural Region; 22 – Ignatovo Morphostructural Region; 23 – synmorphogene upliftings.

Fig. 2 Morphotectonic position of the Bulgarian Microplate (block-diagram model [6])

1 – Bulgarian Continental Microplate, 2 – Moesian Continental Microplate, 3 – Gondvana Continental Macroplate, 4 – Upper Mantil

Character of geomorphological evolution

The territory of Elena Hills are distinguished with low - mountain relief. This complex terrain form is a part of the chain ordered along the parallel hills and ridges in the west part of East Fore Balkan. It is remarkable as well detached orographic unit among the ambient kettles and lowering.

In structure- geomorphological aspect Elena Hills are part of East Fore Balkan west periphery (Fig. 1). Its main axe of development has west- east orientation. Independent of low- mountain relief Elena Hills are very well separated. They mark the border between East Fore Balkan Moesian platform in the part between Veselina, Zlataritsa and Djulyunitsa River- valleys (feeders of Yantra

River). The highly curved pattern of the relief is due partially to Down Cretaceous clay- sand lithological substrata.

The relief in this region is represented by curved and inclined ridge with slightly sloped and immersed northward and southward slopes. The eastern and western borders of the morphounit are outlined by Belitza and Stara reka Rivers.

According [2] and [3], the rise of the contemporary hills- mountain relief and hills- ridge one in Bulgaria in particular within Elena Hills is result of Post Alpine (After Early Oligocene) morphogenesis processes. They have done after almost fully erosion erasing the trucks of the last Alpine morphostructural plan. From them are preserved only some natural strongholds. Therefore the beginning of Neogene contemporary morphogenesis in these places is related to a very wide planning of former Late Alpine relief. It has led to forming of several different aged orthoplains. The last one has risen finally at the end of the Early Pleistocene. It and the others othoplains have have morphological features of wide leveling [4].

The changes in morphotectonic mode which have begun at the end or after the Early Pleistocene obviously were related to endogenic processes of mosaic faulting and block displacement in the deeper parts of the Earth crust. The effects of this crust destruction gradually have led to forming of the first dome and mountain morphostructures under the influence of surface listric tectonic (Fig.3). The new risen positive land forms have disrupted increasingly the orthoplain surface (Fig.4).

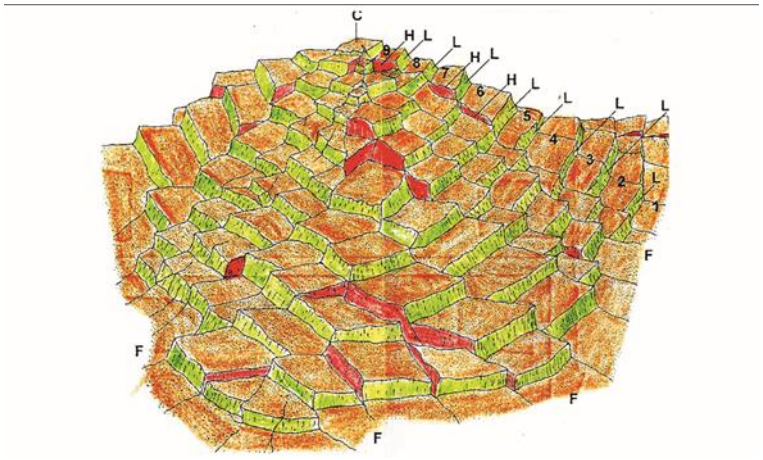

Fig 3 Dome-like morphostructures [5]:

C – listric prism, corresponded with the centrum of maximal intensive uplifting – top of dome-like morphounit; F – foot of the dome-like morphounit; L – listric (low-angle) normal fault; H – high-angle normal fault; 1 – 9 – cascade uplifting line of listric prisms.

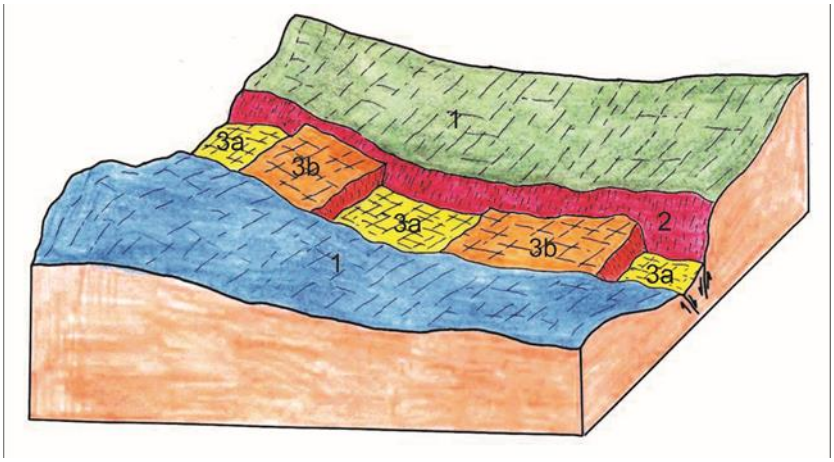

Fig 4 Complex Morphostructural Passage [5]:

1 – flanked positive morphostructures; 2 – fault planes; 3 – complex morphostructural passage: 3a – negative morphostructures (kettles, passages), 3b – thresholds.

The endogenic processes in Elena Hills are comparatively weaker represented. It has given opportunity for better performance of exogenesis processes. Despite of this the whole features of Elena Hills show they represent a low expressed complicit structured positive morphostructure.

It is typical for the researched land forms in Elena Morphostructural Region they are result of brittle deformations. They have risen on the border between two different ambient (atmosphere/lithosphere or hydrosphere/lithosphere). They are formed by the influence of the inherent for the surface part of Earth's crust listric tectonic. The location, shape and dimensions of the positive morphostructures are foreordain by the deep faulting. The speed of rising of separate morphostructures depends by the specific features of the depth vertical ascent and displacement of separate crust fragments (blocks).

The positive morphostructures arise on the background of strongly determined denudation surface (after Pleistocene orthoplain). Every positive morphostructure arise around a fixed center of maximum contemporary ascent (Fig. 3). It has its own local fault network located around the center of maximum ascent and it consist by radial steep orientated sunk faults and concentric orderly inclined sunk listric faults.

The main building element of positive morphostructures is the listric prism (Fig. 3) It is separated between two neighbor radial (steep sunk) faults and two neighbor concentric (listric) faults. They bound the surface of prism – fragment of initial denudation level.

The positive morphostructures consist radial descent from the center of maximum ascent to the periphery of series stepwise descent listric prisms.

The negative morphostructures in researched region are represented by the next river – valley morphostructures – Belitza, Veselinovo, Zlataritsa, Bebrovo and Stara reka.

The positive morphostructures begin to destroy as the speed of ascent get less than the speed of erosion.

These specific features of positive morphostructuresgive determine the contemporary pattern of building relief elements in researched region. According [3] the main role for their arise and growth is the inherent for earth surface and surface parts of the Earth's crust listric tectonic.

Within Elena Morphostructural Region are ascertain truck from initial after Pleistocene orthoplain within Belitza, Zlataritsa and Stara reka River- valley Morphostructure. Greater part of the region covers well represented positive morphostructural elements. The western and the eastern borders of the region are respectively Belitza and Stara reka River- valley Morphostructures. The south border corresponds to the north board of Elena Kettle Morphostructure. North-westward the border of Elena Kettle Morphostructure is a part of the touch between South Moesian and Fore Balkan Morphostructural Zone. The north and north- east borders of this region match with south outskirts of Ravno selo, Dolno Shivachevo and Bukak Morphostructural Region. South – westward bounds with Badevo Morphostructural Region.

In the researched region are found trucks from the first morphostructural generation (after Early Pleistocene orthoplain) and positive land forms from the third morphostructural generation (after Early Holocene dome and mountain morphostructures) according [5] classification.

Conclusion

The contemporary relief and morphostructural features of Elena Hills have arisen during Quaternary morphogenesis in the last 800 000 years. As initial point of these processes has been the Late Pleistocene orthoplain [2], [5].

Elena morphostructural region represent a mosaic with 34 dome morphostructures which have arisen and have developed on the background of Late Pleistocene orthoplain (Fig 5). The main role in arising of this Quaternary morphostructure is for regional deep faulting and surface listric tectonic.

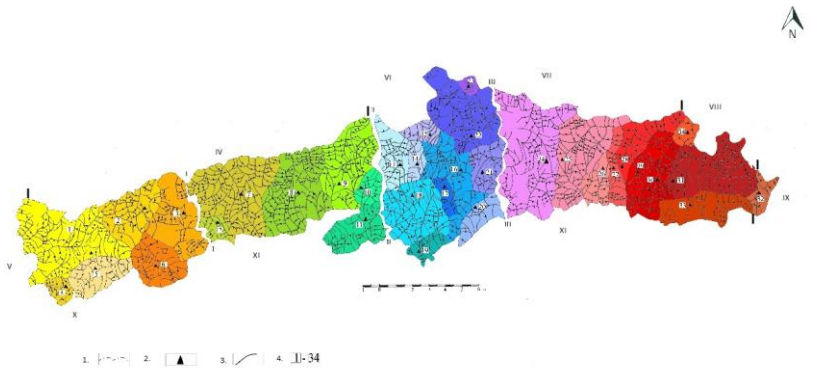

Fig. 5 Morphofructuring map of the Elena Morphostructural Region (Preslav Morphostructural Area)

A – Morphostructural symbols – 1. Boundary of the surveyed area; 2. The center of maximum ascent; 3. Steep sunk faults; 4. Morphostructure number

I-I – Veselinovo River- valley Morphostructure; II-II – Zlataritsa River- valley Morphostructure; III-III – Bebrovo River- valley Morphostructure; IV – South Moesian Morphostructural Zone; V – Mazalat Morphostructural Area; VI – Ravno selo Morphostructural Region; VII – Dolno shivschevo Morphostructural Region; VIII – Bukak Morphostructural Region; IX – Lisa Morphostructural Region; X – Badevo Morphostructural Region; XI – Elena Kettle Morphostructure.

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