

MODERN METHODOLOGICAL ASPECTS OF THE REGIONAL MORPHOSTRUCTURAL ANALYSIS

Abstract: The Earth's relief- sphere is a product of complete interaction between endogenous and exogenous earthly energies. In this aspect main indicators for surface expression of endogen processes are the morphostructures. In the light of the Plate tectonics during the last decades research of morphostructures are introduced new principles and methods presented the contemporary level of geographical knowledge. Now days such modern methodical approach is the morphostructural analysis. Its implementation request perceiving of scientific innovations and strictly clinging to determined geo-dynamic conception for genesis, essence and the laws of outcropping geo- tectonic evolution of the Earth lithosphere.

Keywords: morphostructural analysis, Earth's relief- sphere, endogenous geodynamics.

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Introduction

The proposed regional morphological study is based on generally accepted contemporary and already well-grounded scientific mobilistic Plate tectonics presents for the construction of the upper parts of the Earth's crust from different by size and number oceanic and continental plates [1]. They are found in complex temporal and spatial relationships by the action of endogenous geodynamic processes.

The relief building depends on the current state of endogenous crustal and partially of mantle regional geodynamics. Its energy source is constantly leaking from the Earth's asthenosphere energy. Its impact in "transition" in the most upper parts of the mantle [1] and the Earth's crust dictate the nature of the crustal structure building and determined the main features of the topography through the morphotectonics processes. They are reflected in the combination of:

- 1) specific regional forms of transfer and the interaction of tectonic plates;
- 2) forms of "release" of the asthenosphere energy of the Earth's surface (volcanism, earthquakes, changes in the basic features of relief);
- 3) the interaction between the effects of block and listric tectonics in shaping the basic features of landforms;

The impact of the listric tectonics is essential for the relief building [1]. The listric faulting is unique to the Earth's surface and the most upper parts of the Earth's crust (the zone of the top 10, rarely to 15-20 km [1]). The movements on numerous listric faults by the local fault network [1] allow the formation of the synkinematic positive (dome) morphostructures.

The latter are spatially settled in varying degrees and internally dissected by high angular (normal) faults of local fault network [1].

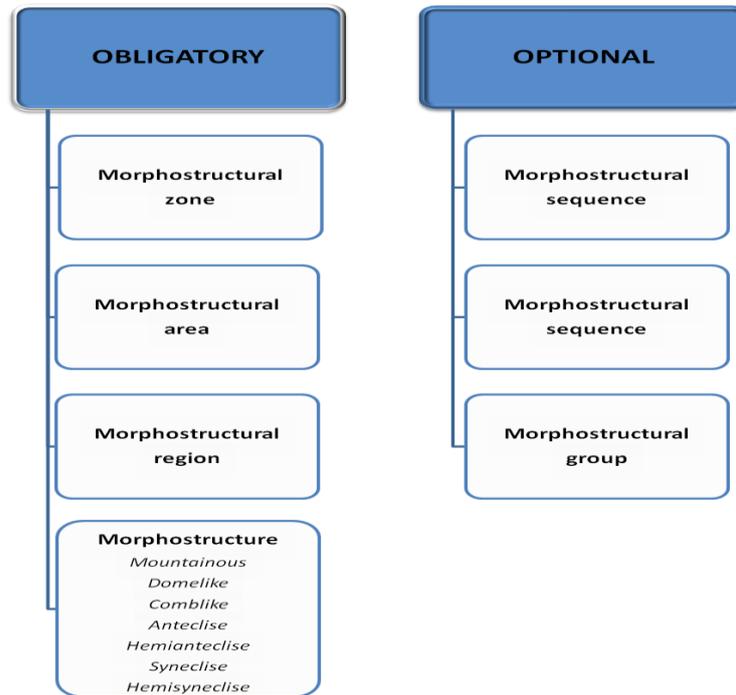
Nature and basic principles of morphostructural analysis

The listric faults are indicators for a manifestation of relief building processes. The newly formed landforms arise replace parts of older output denudation-accumulative surface-orthoplain. It is shaped by the activities of various exogenous processes in a relatively temporary "lull" of the surface expression of the endogenous dynamics in certain area of the Earth's crust. The orthoplains are an epicontinental morphoformations. They consist of alluvial and / or eluvium surfaces, buttes, plateaus and mesas- fragments of ancient reliefs. Within the scope of the orthoplains are absent or almost absent a listric faults. In the emergence of a new generation of positive morphostructures of the remnants of partially destroyed orthoplain form a synkinematic negative morphostructures - plains, lowlands, kettles, morphostructural passages, morphostructural thresholds, morphostructural valley extensions, complex morphostructural passages, morphostructural gorges (Fig. III b). Therefore - in the spatial extent of a regional morphostructural unit (zone, area, region) can be included both newly positive morphounits and synkinematic occurred (of the relics of orthoplain) negative morphostructures.

The impact of various exogenous processes reshapes the peculiarities of predestined by endogenous geodynamics relief. The exogenous processes represent an ongoing effort to leveling of the Earth's surface [1] and the formation of a new orthoplains. Thus are creating the conditions for cycling in a regional relief building. The Earth's surface or reliefsphere's surface [1] formed its own characteristics under the combined effects of the Earth's external and internal forces and their energy sources- asthenosphere and solar energy. This fact determines the main difference between structural and morphostructural analysis. The first of these deformations in the Earth's crust are the product solely of internal Earth's forces [1]. The listric tectonics is the main specific feature of morphostructural analysis. The movements along the listric faults are due to endogenous geodynamics. They modeled the main features of the relief. The details in the appearance of the landforms are due to the interaction between internal and external Earth's forces.

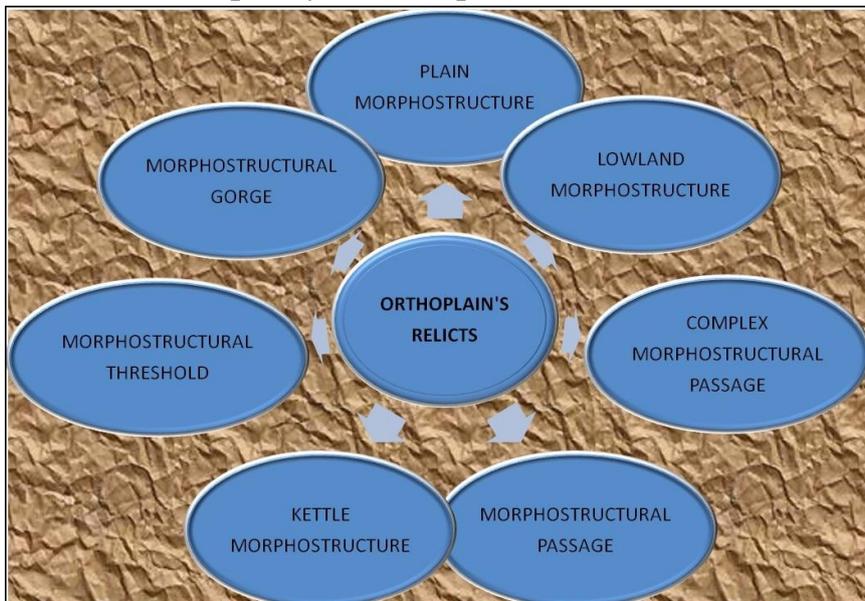
One of the main objectives of morphostructural analysis is to establish the nature of subordination between regional morphostructural elements in the study area. Adopted in this study principled scheme of subordination between regional morphostructural units is represented by Figure I (Fig.I). The morphostructural units come in two types - mandatory and optional. The first set hierarchical sequence of established regional morphostructures. The optional morphostructural units specify certain specifics of the studied relief.

Fig. I
Regional morphostructural units



In turn orthoplain's relicts participate in the formation of many negative morphostructures (Fig. II).

Fig. II
Negative structures shaped by the orthoplain's relicts

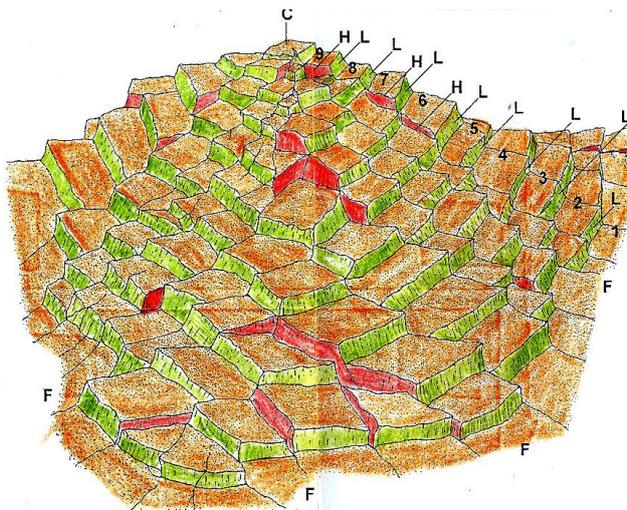


Fault structures are represented by faults, normal (high angular) faults, listric (low angular) faults and strike-slip faults (horizontal shifts). They can form fault bundles or fault zones.

Domelike morphostructures (Fig. III a) [2] are formed around maximal uplifting centers within the space of well oriented by normal (high angular) faults section (block) from the Earth's surface [1]. Its territory is occupied by a local fault network. It consists of a radial relative to the maximal uplifting center normal (high angular) faults and concentric listric (low angular) faults [1]. The areas between the intersection of two adjacent radial and concentric faults are limited listric prisms [1]. Their upper surface corresponds to a segment of the orthoplain's surface. The listric prisms in a radial direction form a listric numbers. She lowered stepwise from the center to the periphery of the morphostructure. The totality of the listric prisms forms the main features of the morphostructure's relief. Domelike morphostructures occurred solely under the action of a brittle deformation.

Anteclises and synclises and their fragmentary versions (hemianteclise, hemisyneclise) are quite flat bends with irregularly shape and are formed on the orthoplain's surface. They are outlined in comblike morphostructural elements. The latter consist of a relatively highest erected a monolithic part (fragment) of the orthoplain's surface and out of her declining gradually extended stretches.

Fig. III



a. Dome-like morphostructures:

C- listric prism,
corresponded with the
maximal uplifting centers –
top of the dome-like
morphounit

F- foot of the domelike
morphounit

L- listric (low-angle)
normal fault

H- high-angle normal fault
1-9- cascade uplifting line of
listric prisms

b. Complex morphostructural
passage:

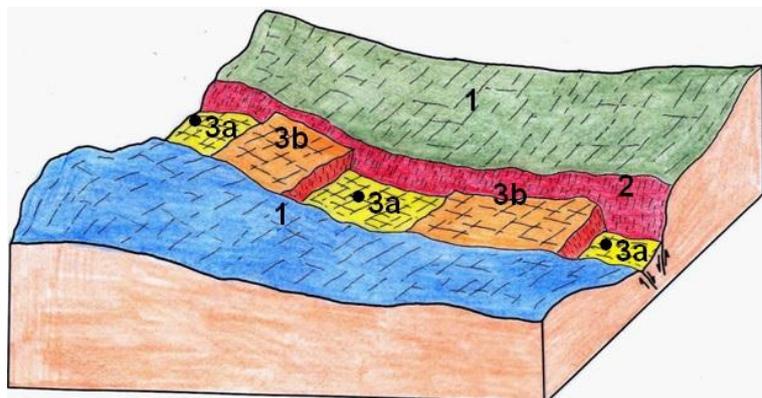
1- flanked positive
morphostructures

2- fault planes

3- complex morphostructural
passage:

3a- negative morphostructures
(kettles, passages)

3b- thresholds.



The scale of the maps is of great importance in regional morphostructural and morphotectonics investigations. It determines the level of informativeness of the maps. The latter are separated conditionally on small-scale, medium-scale and large-scale maps.

The small-scale morphostructural and morphotectonics maps (with scales smaller than a 1:500 000) serves as a general overview of the most common comparisons between the topography of large-sized land areas. They may contain boundaries of morphostructural areas and sometimes – on morphostructural areas and regions.

The medium-scale morphostructural and morphotectonics maps (with a scale between 1:500 000-1:100 000) inform the scope of morphostructural areas, zones, regions, groups of morphostructural units, maximal uplifting centers, traces of older concentric morphostructures, relicts from the source orthoplain.

Small-scale morphostructural and morphotectonics maps (with scales larger than a 1:100 000) contain different details of the internal structure and characteristics of different morphostructures.

Morphostructure's maximal uplifting centers informed of the relative speed of vertical displacement and the delineation of areas with different rates of orogenic processes.

Clarifying the regional morphotectonics environment necessary to conduct correlative analysis between finding of morphostructure and the results of previously conducted seismic, palaeogeographic investigation and various morphosculptural features of the surveyed lands. The correlative analysis between morphological features of the topography and regional events of seismic hazard allows interpretation of geodynamic processes in the Earth's crust.

These and many other opportunities for comparative analyzes and interpretations suggest the need for detailed as possible (according to the accepted scale) regional morphostructural map in modern morphotectonics research and analysis.

Conclusion

An overview of the nature, characteristics and role of morphostructural analysis as one of the main methods of morphostructural geomorphology shows its possibilities to study the Earth's topography. This creative method has not only scientific knowledge, but also a certain practical value. That is right because the condition of the Earth's relief is one of the possibilities to get informed about the nature of the effects of endogenous processes on the lithosphere. Natural continuously "release" of the asthenospheric energy by volcanoes and earthquakes necessarily passes through the Earth's surface and affects Earth's relief. It is therefore obvious is the need to make the most detailed study. And this is the enduring relevance of morphostructural analysis – one of the important ways to explore the geodynamics of the Earth's surface.

The adopted theoretical and methodological approach of the study has the character of an "open system". It can be supplemented with scientific innovations and dispose of inaccuracies and outdated scientific ideas.

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