
THE ROLE OF GEOMORPHOLOGICAL CONDITIONS IN THE SUSTAINABLE OF THE TERRITORY OF THE REPUBLIC OF ALBANIA

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Abstract: The present paper aims to study, geomorphology closely related to physico-geographical conditions and the main aspects of human development of the territory of the Republic of Albania. We have mainly focused on the detailed analysis of morphology and morphogenesis, drawing on the stages of its morphotectonic and morphoclimatic evolution. The diversity of the natural environment and the scientific problems that the relief presents for solutions and direct practical values, promote the necessity of undertaking a study at the contemporary geomorphological level. The field expeditions have analyzed in detail the factors and causes of the formation of the simplest relief forms to the most complex and complex ones, illustrating each morphogenic phenomenon by geographical distribution. From field expeditions, measurements and observations have been made of the diverse geomorphological, hydrological, pedological, plant phenomena and processes and of the effects of human intervention. Some detailed factual data for the analysis of external morphogenic phenomena are still missing as they are difficult to observe directly and consequently they are supplemented with information provided by local residents. New data have been presented in the terrain genetic framework, serving as a support for the further deepening of studies in the field of geomorphology, physical geography and the natural environment as a whole, serving as the basis for the analysis of specific geomorphological units of our country. The realization of this study is based on a long years of field research, using simultaneously the data of geology, physical geography, climatology, hydrography, pedology, vegetation and environment. Theoretical preparation, associated with rich information from the field, has enabled the implementation of the above work, which synthesizes current geomorphological research with related sciences. Complex analysis of geomorphological problems, as one of the main priorities is placed at the center of the study, alongside physico-geographical ones, closely related to natural resources, environmental degradation and territory regulation. Geomorphological features and physico-geographical elements should be put in place for the organization and regulation of rural space, contributing to a fuller understanding of morphological phenomena and explaining the causes and consequences of some human factors in the development of external terrain modeling processes. The fullest determination of the geomorphological features of the relief of Albania will require the realization of proper geomorphological regionalization by applying contemporary criteria.

Keywords : geomorphology, factor, physico-geographical elements, rural space

1. WORKING METHODS

The first phase of the article preparation work is the collection and research of the necessary scientific literature and the use and collection of the nearest geographical information. The method of comparison has been used in the analysis of all natural and human components of the mountain slope of the slope, which has helped us to clearly present the dynamics of relief development during morphotectonic and morphoclimatic evolution, as well as current and prospective phenomena.

2. GEOGRAPHICAL POSITION

This favorable geographical position of the mountain range is related to the extension of tectonic zones of Korab, Mirdita, Krasta, Kruja and Jonian, lithological content, fault and folding structures, abundant waters and rich forest vegetation. In morphogenic features, lithological content has also played a role, which is represented by a variety of rocks, especially the widespread presence of ultrabasic, flysch, limestones and molasses, leading to the formation of diverse relief forms. The geographical position in the southwest part of the Balkan and the high elevation values have significantly influenced the climatic, hydrographic and vegetation characteristics, enabling rich rainfall and snowfall, with long periods of frost especially on the ridges. Whereas the presence of small values of absolute altitude 300-500m, has influenced the penetration of cold and dry air masses from the northeast and wet air masses from the northeast, northwest and west. Climatic conditions are important for the development of active morphogenesis, reflected in the modeling of current relief patterns. Among the major factors influencing climate formation are cyclonic and anticyclonic activity, position, altitude, shape, size and degree of relief. The position of this territory as part of the Balkan, near the crossroads of some air masses, has conditioned lower temperature values, with frequent inversions and relatively long periods of frost.

3. GENETIC TYPES OF RELIEF

The relief forms modeled on limestone structures preserve the general morphological features of the active karst plateau, whereas in the ultrabasic composite sections, relief forms are characterized by high values of density and depth of fragmentation, clearly expressed with intensifying morphological contrasts. Modeling of the morphological complex of the mountain ranges has played an important role and the external morphogenic phenomena, especially the fluvial and karstic processes, forming a dense network of deep rivers and valleys. The latter divide the mountain ranges, which for the most part rise almost directly from their bottom, displaying slope patterns with morphological contrasts. The predominance of tecto-dynamics with high amplitude of tectonic uplifts over (1500-1800m), is reflected in the large values of absolute height of the slopes of Korab and Tomor ranges, while the values of 1800-2200m of these elevations are characteristic for structures during which the ridges were formed. The values of tectonic uplifts have determined the depth of the disintegration of the terrain from 300-500m / km², giving the features of a complex terrain, especially along the ridges of Nemërçka, Trebeshina and Polis. Characteristic is the direction of the extension of the mountain ridges with the confined river valleys of Drin, Vjosa, Shkumbin and Devoll. During the morphotectonic evolution, fragmentary depositions at the foot of the mountain ridges, are the result of tectonic uplifts of the corresponding structures. Morphostructural and morphogenic phenomena have given relief a complex character, reflecting on the genetic complexes present.



Map 1. Map of geographic position of territory of Republic of Albania.⁹

Physical properties of bare carbonate rocks and vegetation which is poor in some sectors, affecting the values of temperature amplitude and air humidity. Complex relationships between landforms and the external environment were indicated. Geomorphic systems are often affected by episodic large events such as volcanic eruptions, glaciation, and megafloods which lead to a disturbance of system adjustment, sometimes in a catastrophic way. Also, responses of geomorphic systems to external changes tend to be nonlinear, including lag time, relaxation time, and thresholds.¹⁰ Tectonic setting is the primary control on the regional physiography and landscape character. The regional tectonic settings of active plate margins, passive continental margins, and continental interiors strongly influence landforms through styles of tectonic deformation and uplift, differences in dominant lithology, and changes in the degree of fracturing (which affects erosion resistance).¹¹ As the altitude increases, the temperature values, the amount of precipitation change, and their fall into snow form, where the layer and elongation increase towards the higher sections of the mountain ridges. The hydrographic network is part of the Drin, Shkumbin and Devoll, Vjosa basins etc with their respective tributaries, which represents one of the most important external morphogenic phenomena in relief modeling. This surface hydrographic regime is associated with the dense development of karstogenesis, which has defined the development of a dense underground network, circulating in canals, galleries, and caves of varying sizes, directions, and levels. An important indicator of the development of underground karst on limestone ridges is the presence of karstic springs that emerge during the tectonic contact of

⁹ <http://www.maphill.com/albania/3d-maps/physical-map/>

¹⁰ Oguchi.T. Butler.D. *The International Encyclopedia of Geography. Chapter Geomorphic systems.* © 2017 John Wiley & Sons, Ltd. Published (2017).

¹¹ Bierman.P. Montgomery.D. *Key concepts in Geomorphology.* U.S.A.(2014)

limestone with impermeable flysch and ultrabasic rocks. There is a close relationship between the monthly and annual flow of the flow regime with that of the climate elements with the monthly seasonal and annual flow and geological factors. Within the vegetable world are the bushes, oaks, beech and pastures, developed in brown, brown forest, magnesium and mountain meadow. The geological position has determined the development of genetic terrain types, the development of river, sloping and karst modeling processes. The mountain range boundaries are of morphotectonic, morphogenetic and morphological character. Tectonic setting and structural geology influence landforms through the direct action of faulting and through the indirect influences of spatial variability in erosion resistance generated by folding, faulting, and offset of rocks of differing lithology.¹² Horst structures are grouped in the form of blocks, which are distinguished by a generally horizontal surface, where each horstic structure is bounded by pre-erosion structures through tectonic breaks. There is a system of horsts and grabens, which are characterized by a regular alternation between them. If the slope of the planes of normal tectonic disruptions that constrain the horst block wings have a value of 60° , then this will cause their unstable state, subject to gravitational phenomena. With the development of the phenomenon of extending the base of the horst block in depth, the phenomenon of stability of tectonic conditions is caused.¹³

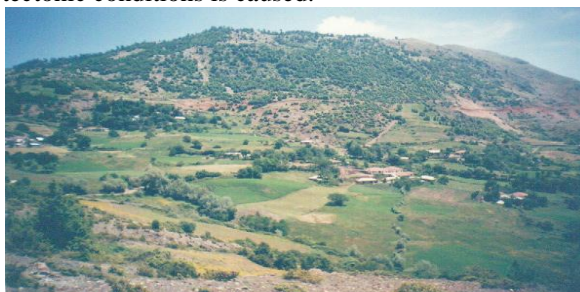


Photo.1. Degradation of slopes in central part of territory of Albania

The presence of Egnatia Road along the central sector, has transformed the latter into a highly strategic connecting area between the central and southeastern part of the country. The main itineraries and paths takes on great importance for road transport and beyond. Whereas the geological, geomorphological, climatic, hydrographic, pedogenetic and forest resources represent great economic value for the mountain range and the country scale. Coastal relief represents much of the coastline of our country and lies under the wave modeling of a complex process of irregular deposition progression and withdrawal, occurring on a low relief surface.¹⁴ In the eastern and central parts of Albania, relief is also formed on magmatic mountainous massifs and in structures that have been subjected to horizontal displacement or tectonic thrusting with high values of amplitude displacement, as well as in older graben systems. age and those of the Plio-Quaternary age with north-south direction. River valleys are formed during tectonic faults of the normal type, while the direction of these valleys coincides with the tectonic faults plan, and they generally appear more extensively than other valleys, phenomena related to tectonic origin. If these factors mentioned above are large, then the slope preserves the features of the vertical sites, thus matching the tectonic detachment plan. Otherwise, when the river hydrographic network deepens at a slower rate, during tectonic contact between the blocks with minor changes in rock hardness, then the river network develops and operates quite slowly. The slope of the cleavage line is represented by steep slopes with very intensified morphological features, when the rate of deepening of the river hydrographic network is faster than the rate of upward tectonic movements.¹⁵ Albania's coast stretches from north to south with a length of 454 km including the lagoons that are part of it. Also, it is coastal sector where the phenomenon of sea abrasion and the surface erosion is reflected in the dynamics of coastline and all this associated with many problems, environmental, panoramic, ecological, social and economic that need therefore the scientific study. The need for a further analyse in the field of environmental protection have been the starting point of this study with a scientific character. To deliver more useful results, especially for users of the land, we paid attention to practical action tracking (monitoring) erosion process and through comparison of maps, values, factors that constrain change, etc.¹⁶ Deposition type of coasts generally develop in low-lying lowland

¹² Collective authors. *Geological map of the Republic of Albania*, Tirana, (2002)

¹³ Birot.P. *Morphologie structurale*. Presses Universitaires de France. (1958)

¹⁴ Balla.A. *Evolucioni morfotektonik dhe morfologjik i zonës bregdetare Shëngjin-Vlorë*. Dissertation. (2015)

¹⁵ Birot.P. *Morphologie structurale*. Presses Universitaires de France. Tome Premier. Paris France. (1958)

¹⁶ Mëneri.A. *Dinamika e erozionit ne Gjirin e Durresit nen efektin e faktoreve humane dhe natyrore*. Dissertation. (2016)

areas and extend over seawater and progress mainly faster in terms of territorial extension due to the seabed and river-marine deposition process. In the vicinity of the present maritime shores, the one-way coastline, that is to say initial conditions, is at a distance of several kilometers from the sea. The diverse forms of these coasts are closely dependent on the morphological features of the coastal patterns modeled on them. Therefore, it is important to determine their types, depending on their relative importance in coastal configuration. Deltaic coasts are characterized by special terrain configuration, which is a consequence of much of the river activity through the solid flow they deposit, rather than through marine activity. They favor conditions favorable for their development in seas, which are distinguished for low-intensity marshes, or where rivers accumulate or deposit large amounts of alluvial cones, over the continental platform, slightly overflowing.¹⁷ As a result of the marine erosion which is very noticeable and very intense, the presence of army bunkers in the interior of the sea, which we have in many cases considered as fixed and evidencing points, is very clearly demonstrated. The line in general and further along the area near the beach appears to be highly degraded where the configurations and geometry of sandy beaches are limited and the effect of erosion which has brought to shore surface formations.¹⁸ The morphology of the surface and subsurface karstic forms of their respective size is mainly related to tectonic conditions, especially fault structures, as well as tectonic uplift and differentiated tectonic movements associated with tectonic faults and reactivating old faults, stimulating karst.¹⁹ Poljes have width from several hundred meters to several kilometers, while the length ranges from several miles to several tens of kilometers. Poljes characterized by a dense underground hydrographic network and for the karstic landforms, such as karst valleys and uvalas. The karstic type of karst has a wide territorial extension in Albania due to the large presence of carbonate rocks such as dolomitic limestone, having a total area of about 1/4 of the territory of the country and favorable physical-geographic conditions for the development of dissolution chemical processes. Many of the poljes lie within the mountainous ridges and ranges, which during the cold periods of the Pleistocene epoch, when they have undergone the glaciation process, which has provided an important contribution to the supply of large quantities of water and the massive transport of detritic materials from the river basins. The poljes, like the karst landforms, have contributed to the preservation of the ruins of depositions, derived by the melting ice and the activity of rivers. They have their own internal drainage systems and often have complex hydrogeological features, including swallow holes and flows, that disappear inside the bedrocks. Poljes are often used for farmland, while they are flooded only during a season of the annual periode. In some of their segments, the cuesta landforms have been formed, where the little inclination of the flysch layers is clearly visible with generally low-thickness of flysch. Gravity, flowing water, and temperature changes are the main forces behind hillslope processes, with the action of animals and plants being important in some situations. In some parts of the world, similar features have been built to protect infrastructure from other types of mass wasting. Weathering on hillslopes, as elsewhere, includes the in situ conversion of bedrock into regolith and the subsequent chemical and mechanical transformation of regolith. Several hillslope processes serve to transport regolith and other weathering products. They range from slow and continual processes to rapid and intermittent processes.



Photo.2. Mass wasting in central part of Lisec mountainous ridge

Splash processes into three categories: soil creep, and rainsplash and sheet wash. Rocks are subject to stress and gravitation.²⁰ The mass movement types, distribution and shapes are strongly controlled by both the lithological characteristics and the multi history structural setting. Active slow-moving landslides, commonly characterized by

¹⁷ Coque. R. *Geomorphologie*. Text universitaire. Paris, France. (1978)

¹⁸ Mëneri.A. *Dinamika e erozionit ne Gjirin e Durresit nen efektin e faktoreve humane dhe natyrore*. Dissertation. (2016)

¹⁹ Krutaj.F. *Disa tipare te morfologjise karstike ne vendin tone*. Studime Gjeografike. Nr.5. (1995)

²⁰ Hugget.R. *Foundamentals of Geomorphology*. U.S.A. (2017).

multiple and superimposed landslide bodies, confirming that the spatial distribution of the recent landslides is frequently influenced by the presence of older landslides. New mass movement of the river catchment represents a useful tool for territorial planning, and engineering-geological and environmental purposes in the study area. It is, also, the starting point for both quantitative landslide risk analyses and the design of the most appropriate risk mitigation measures.²¹ In the present period, the rather large size of the surface scattering process has led to the removal of the copolymer material, resulting in the stripping of the surface of the rock, from the fragment of the copolymer material, where some forms have been created for the finish. small such as karstic furrows and variegated variegated. The deep-dipping process of karst activity has been a consequence of very intense tectonic movements during alpine orogenesis, resulting in forms such as dense and deep chimneys, and very large stalactites. Whereas in the mountainous system of Dinarides in the western Balkans, varying degrees of flooding of the karstic limestone surfaces occur, resulting in the formation of a surface water network. The glaciers, which migrate in a concentrated form, along the bottom of the valley, which is associated with a steeply sloping slope, result in the formation of "glacial trough" or "glacial valleys" valleys. The slopes of glacial valleys, which reach a relative height of up to 1500 m, generally interfere with secondary (secondary) valleys and morphologically model the forms of river relief that existed prior to the appearance of glaciation, creating, consequently, "glacial valleys" dependent ". Cirques vary in size, ranging from simple-type microdepressions of several tens meters wide, preserving amphitheater-like features up to several kilometers, and the height of their boundary slopes reaching up to hundreds of meters. The snowstorm factor represents a very important element in the context of the circular glacier mass balance, determining the morphological development of the cirque. Cirques formation is also supported by the phenomenon of snow melting around the mass of firn. But because the cirque type glacier is distinguished for its generally irregular configuration, then the movement of this glacier appears very different in relation to the movement or displacement of other glaciers.²²

4. HUMAN IMPACT

In the current situation, but also in the perspective, these studies have become indispensable for the great advantages they offer. This is because the changes of the system after communism epoch, were accompanied by major changes in the geographical distribution of the population and its structure, changes in the structural structure of the economy, the directions of development but also its geographical distribution etc. All these have changed and are rapidly changing the character, functions and extent of the geographical regions, thus changing and reorganizing the Albanian geographical space itself. Developments have been spontaneous, even chaotic. So the negative consequences are not scarce in all respects. Unless chaotic developments are studied and addressed scientifically, these consequences will deepen and become much more difficult to resolve. This would also require the assistance of geographical studies, which with in-depth scientific treatment and analysis of geographical problems, makes them applicable and capable of helping to meet ever-greater, ever-increasing challenges. the difficulties that human society is and will continue to face.²³

5. RECOMMENDATIONS

Given the detailed analysis of the morphological and morphogenetic framework and some of the human aspects of the territory of Albania, we are thinking of making the following recommendations with scientific value.

The diverse and complex character of the relief requires further studies to fully understand the chronological problems of the morphotectonic evolution of the terrain genetic types.

The widespread and very complex extension of the genetic complex of structural relief requires a special study of the stages of its morphotectonic and morphological evolution, and especially of the new and present tectodynamics of this development.

Determine the geographical distribution of avalanches, especially their respective itineraries and dimensions, along with the construction of some barriers and the planting of some forest stands. In the high seismicity sectors, detailed studies should be carried out on the construction of road and tourist infrastructure.

Studies on karst development should be planned in the context of karst relief, especially during the Pliocene-Quaternary evolution, during which a variety of karst forms occur.

²¹ Borrelli.L. Muto.F. Geology and mass movements of the Licetto River catchment (Calabrian Coastal Range, Southern Italy) *Journal of Maps. Volume 13, - Issue 2.* (2016).

²² Summerfield.S. *Global Geomorphology.* Text, New York U.S.A. (1991)

²³ Sherifaj.M. *Mallakstra. Studim gjeografik. Dissertation.* (2015)

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