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ARTICLES

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MORPHOSTRUCTURAL FEATURES OF THE WEST CARPATHIANS

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On the base of morphostructural analysis a new synthesis of the basic morphological features of the West Carpathians has been presented. The author explains the character and development of the West-Carpathian megamorphostructure and in its frame he interprets macromorphostructures as units of second order, resp. mesomorphostructures of the third order. The interpretation has been made in the light of the mobilistic (plate tectonics) theory.

The West Carpathians, within the Carpathian mountain arc, represent a special geomorphological province, even may be said a morphostructural megaform, relatively of a self-contained position. The morphostructural individualization of the West Carpathians manifests itself in the form of an extensive, but relatively flat upwarp of an elliptic lay-out (E. Mazúr 1965). The ellipsis of the West Carpathians has a longer axis stretching in the direction WSW--ENE, above 400 km long, and a shorter one above 250 km long. Although the West Carpathian morphostructural ellipsis is considerably differentiated interiorly, as demonstrated later, outwardly, in contrast with the neighbouring morphostructural units, it differs very strikingly both morphologically, tectonically, and by lithostructure. On the inner side, it is delimited very strikingly facing the Intra-Carpathian basins, namely the Great and the Little Danube Basins, and the Vienna Basin. In the outer side, the ellipsis of the West Carpathians is confined clearly facing the Hercynian epiplatforms of the Bohemian Massif and those of the South-Polish block by a continuous belt of depressions of the Carpathian foredeep. Solely, in the NE the boundary of the West Carpathian upwarp is less sharp. It manifests itself morphologically and tectonically, but not lithologically. The matter is the stretch between the Sandomierz Basin and the northernmost spur of the Great Danube Basin, in which the Flysch Belt connects the West Carpathians with the East Carpathians. Nevertheless, also here, however, a striking transversal depression takes place across the Flysch Belt in the area of the Nízke Beskydy Mts and is of a hilly--land to bergland nature, with altitudes above sea-level about 500—600 m. The

axis of this transversal depression includes an acute angle with the axes of the nappe-fold structure and is undoubtedly tectonic and younger than they themselves.

From the viewpoint of detailed lay-out character of the West Carpathian morphostructure it is necessary to state that its course is about in ¾ of the circumference relatively continuous, little zigzag, consequently literally close to an ellipsis. This phenomen occurs along all the NW, N, E and SE circumference. Solely in the SW, in front of the Vienna Basin and the Little Danube Lowland the elliptic shape is impaired and the morphostructure of the West Carpathians run out digitally by partial morphostructures to sub-Carpathian depressions the ellipsis opens here. It cannot be out of question that this phenomenon connects with total movement tendency of the West Carpathian morphostructure as demonstrated later.

A characteristic mark of *the West Carpathian Upwarp* is its extreme interior morphostructural differentiation represented by a mosaic of two contrasted formations, namely positive and negative morphostructures (mountain ranges — basins). This interior morphostructural dissection of the West Carpathians is, however, subordinated to a unifying unit of higher order, i. e. to the West Carpathian Upwarp. This subordination manifests itself by the rise of altitude above sea-level of both the contrasted morphostructural elements (mountain ranges and basins) from the fringes of the upwarp towards maximum inside the West Carpathians. Of course, the rise of the altitude of basins above sea--lavel is slower and ranges roughly from 150—200 m to 800—1000 m a. s. l., in positive morphostructures the altitude above sea-level increases from some hundreds of metres in the circumferential parts of upwarp up to over 2500 m in the core of upwarp — in the Tatry Mts. The discordant increase of altitude above sea-level of these contrasted morphostructures manifests itself in the core of upwarp by relative height differences of 1000—1500 m. Thus, it is the core of the West Carpathian Upwarp that is dissected most intensively.

Another mark of the dissected upwarp of the West Carpathians is its *asymmetry,* namely both in vertical and horizontal sense. The marks of asymmetry in vertical sense are close connected with the lay-out and intensity of occurrence of positive and negative structural wholes. The inner Carpathians are substantially more intensively dissected than the Outer Carpathians.

The most characteristic mark of asymmetry of the West Carpathian Upwarp is an extremely eccentric position of the summit of upwarp — the Tatry Mts in northeastern part of the West Carpathians. The Tatrian maximum of upwarp is situated only about 90 km from the fringe of the West Carpathians. This asymmetric position of the summit of upwarp reflects also upon the pattern and lay-out of river system. The major rivers as the Váh, Nitra, Hron, Hornád, and Ipeľ belong to the drainage-basin of the Black Sea, and only the Dunajec and Poprad are directed to the Baltic Sea.

An attempt to interpret the asymmetry of the West Carpathian Upwarp is found already in a hypothetical level. Similarly, also an interpretation of the fact that the outer fringes of the West Carpathian morphostructure are continuous, almost elliptically regular and sharp delimited by the foredeep, while southwestern ending is morphostructurally dissected, digitally opened, is difficult. From a mobilistic aspect (global tectonics) it would be possible to quest for an interpretation in a general shift of the West Carpathian morpho-

structure. Owing to a shortening of space, this remains compressed on the outer side. On the contrary, in the hinder part of the shifting block, differentiated tectonic radial movement occurred due to tension being released. Also the direction of this movement is indicated by general vertical and horizontal lay-out of partial morphostructures and by their asymmetric lay-out. In contrast with the direction SE — NW traditionally stated in geological literature, a movement S — N to SSW — ENE shows more probable for the existing Neoid morphostructure of the West Carpathians.

The West Carpathian dissected upwarp is divided into two morphostructural units of a lower order, namely the block of *the Inner Carpathians* and the arc of *the Outer Carpathians.* A very striking morphological boundary between these two morphostructures is an almost continuous belt of lowlands bound to the course of the Klippen Belt. This manifests itself also as a striking boundary of subsurface structures — the so called peri-Pieninian lineament (Zoubek-Maška 1960). It stretches along northern circumference of the Malé Karpaty Mts, through the Stredovážske Podolie (Middle Váh Lowering), along northern circumference of the Fatra and Tatry Mts, where it is some less conspicuous, and then it repeatedly deepens in the northeast between the Pieniny Mts and the Košice Basin as the Spišsko-Šarišské Medzihorie Mts. In the east, it goes on, then, as a striking depression in the Beskydské Predhorie foreland separating already within the area of the East Carpathian structure the Vihorlat-Gutin structural unit from the Outer Flysch Belt. It is to be mentioned, it is true, that in this area, it is crossed by a striking subsurface disturbance delimiting the West Carpathians from the Pannonian Basin along the eastern side of the Slanské Vrchy Mts., resp. the transversal disturbance of the Nízke Beskydy Mts between the East Slovakian Lowland and the Sandomierz Basin. *The morphostructural dualism* is, in this way, a further striking feature of the West Carpathians.

Characteristic for the Inner Carpathian block is a classical development of contrasted block to fold-block structures irregularly mosaically arranged. The spatial arrangement of these basic macro- and mesostructural elements of the Inner Carpathians has no marks of zonality, it cannot be derived, within the present-day morphostructural pattern, as a formation of fold, resp. nappe--fold processes of the Mesozoic or Paleogene Era, but it is a formation of Neoid movements with prevalence of vertical movement. The differentiated neotectonic movement have formed here literally *a mosaic of positive and negative* morphostructural forms, whether the matter be the older Paleozoic elements or folded and shifted Mesozoic formations, eventually volcanites. The axes of these Neoid blocks differ to various measure from the axes of pre-Neoid fold movements.

The Inner West Carpathians are divided, further, into five morphostructures of a lower order. They are:

1. semimassive structure of the Slovenské Rudohorie Mts,
2. Fatro-Tatrian fold-block structure,
3. volcanic block structure of the Slovenské Stredohorie Mts,
4. block structure of the Lučenec-Košice Depression, and
5. block structure of the Slaná-Matrian arc.

The structure of the Slovenské Rudohorie Mts is the oldest element of the West Carpathians, with striking marks of the Hercynian tectogenesis. It re-

presents a relatively consolidated block, in which, at present, the interior differentiation takes place by processes exogenetic rather than tectonic, and is characterized by extensive planation surfaces of the Neogene age.

The Fatro-Tatrian structure is noted for a whole series of smaller crystalline cores with younger fold elements in a shape of positive morphostructures on the one hand, and for negative morphostructures with sedimentary formations of the Paleogene and Neogene ages on the other. It is in the Fatro-Tatrian morphostructure where the differentiation tectonic movements reach their maximum.

The structure of the Slovenské Stredohorie Mts is built predominantly of volcanic masses overlying older elements, locally also Neogene sediments and is noted for an intensive fault structure with unevenly sinking blocks. The present-day macroforms are a reflection of no volcanic activity, but of Neotectonic block movements.

The Lučenec-Košice Depression represents a set of macro- and mesostructures conditioned predominantly by negative movements along the southeastern circumference of the Rudohorie block.

The last morphostructural element of the West Carpathians, on the confines of the Pannonian Basin, are positive horst structures bound to the inner volcanic arc. Although there are volcanic masses predominantly here, it is necessary to emphasize repeatedly that as a macroform the *Slaná-Matrian Area* is conditioned by positive movements of blocks.

In contrast with the Inner Carpathians, *the Outer West Carpathians* are noted both for their zonal course and a lesser interior structural variety. By age and morphostructure, we distinguish here both a relatively narrow *peri-Pieninian lineament* and *the Flysch Belt* proper. Although the peri-Pieninian suture has substantially an anticlinorial interior structure, from morphostructural viewpoint it manifests itself as a structure projecting in a depression, which is suggested strikingly by its morphological nature.

The Outher Flysch Belt is marked for a nappe-fold structure, which is, however, desintegrated to a considerable measure by uneven block movements. Although traditionally the high Flysch massifs are considered as a product of selective erosion processes, there is a whole series of evidence that there are blocks positively moving here, the morphological individuality of which often is emphasized also by resistance of rocks. The development of contrasted negative and positive forms in the Flysch Carpathians does not reach, by far, the intensity in the Inner Carpathians, which is conditioned, to a considerable measuse, above all by different physical properties of the Flysch substratum (greater plasticity).

As demonstrated, the structural nature of the West Carpathians is very varied, which is owing to a long and complicated development from the Paleozoic to present. The complicated tectogenetic development consisting of several stages of very differentiated character has conditioned overlapping of some structural styles or structures within the present-day morphostructures — it has conditioned their *structural polygeneity.*

We distinguish three basic structures in the West Carpathians, namely the Paleozoic Hercynian structure, the Mesozoic-Paleogene Alpine fold structure, and the fold-fault to block-shaped Neogene structure. The massive Hercynian

structure together with pre-Paleozoic elements represents probably the oldest structural element of the West Carpathians. Therefore, it is called *Paleostructure*. The folded, resp. nappe structure closing the geosynclinal development stage of the West Carpathians is called *Mesostructure*. At last, the youngest fold-block structure conditioning the mosaic arrangement of positive and negative macroforms within the upwarp of the West Cárpathians is called *Neostructure* (E. Mazúr — 1965). The West Carpathians, in present-day morphostructural conception, whether from the viewpoint of a whole as megastructure or from that of their interior division into basic macrostructures, are close connected with the development of Neostructure. The influences of older structures, whether that of the Hercynian Paleostructure or that of the Alpinoid Mesostructure, manifest themselves indirect mostly. An exception is made here, to a considerable measure, by the Outer Flysch arc.

The development of the massive Hercynian Paleostructure as the oldest structural element of the West Carpathians reaches probably down to the Pre-Cambrian (H. Stille 1953, M. Máška — V. Zoubek 1960). The basis features, however, were impressed by the Hercynian tectogenesis.

The Hercynian Paleostructure represented by a consolidated massive structural formation, which became the crystalline core for further development of the West Carpathians. In the course of the Meso- and Kainozoic this structure was strongly deformed, broken up and sunk deep mostly. In the course of the Mesozoic and Kainozoic the Paleostructure was affected by changes connecting with the development of Mesostructures. Nevertheless the Paleostructure very strongly influenced direct and indirect the Mesoid development of the Inner West Carpathians in the stage of geosynclinal development and later in the phase of morphological development of this area, too. Morphostructural dualism of the West Carpathians, in other words, the division into the Inner and Outer Carpathians is conditioned substantially by the Hercynian Paleostructure. The Inner West Carpathians bound to the basic structural elements of the Hercynian Paleostructure are interiorly morphostructurally differentiated above all under the influence of the Paleostructure. The block-shaped mosaic structure of the Fatro-Tatrian type along the outer side of the inner-Carpathian block on the one hand and a semimassive morphostructure of the Rudohorian type on the inner side of the West Carpathians on the other were conditioned by partial blocks of the Paleostructure broken up and by uneven movements of them in the Inner West Carpathians.

Besides these indirect influences upon the tectogenesis of the Inner West Carpathians also its direct influence upon the present-day morphostructures reflects, namely on the the one hand in the Fatro-Tatrian area in a form of hard crystalline cores rising to the surface in positive macrostructures of the so called core-Mesozoic mountain ranges, and on the other hand it forms a semimassive undulate, moderately warped up macrostructure of the Slovenské Rudohorie Mts.

The development of the Alpinoid zonal Mesostructure shows to be bipartite, namely both of a spatial and chronological viewpoint. On one side it is an older, substantially Mesozoic inner-Carpathian region Mesostructural development bound to the so called Slovakian block (M. Máška — V. Zoubek 1960), and on the other side a younger Tertiary outer arc. As mentioned above, the Paleostructure of the Slovakian block in phase of the Mesozoid development, i.

e. already beginning with the Upper Permian and mainly since the Triassic, it is an area of subsidence. By this a geosynclinal period in the development of the West Carpathians begins. On the Hercynian basal structure of the Inner Carpathians, unevenly subsided, an intensive sedimentation occurred in the course of the Triassis, Jurassic and Lower Cretaceous, it is true that differentiately in dependence upon unevenly subsided blocks of the Paleostructure. At the end of the Middle Cretaceous intensive folding processes of the Alpine type occurred here. The result was the folding of the Mesozoic sediments, in places also with fragments of the Hercynian underlying elements, into complicated tectonic units of a fold or nappe nature. In this way the Inner Carpathians have acquired a nature of nappe-fold mountain range with three basic chains, namely: the Rudohorian (Gemeride one), Tatro-Fatrian (Tatro-Veporide one), and the Klippen one (D. Andrusov 1958, M. Maheľ 1960).

The Upper-Cretaceous development of the Mesostructure shows not quite clear, namely owing to lacking sediments of this period. Towards the end of the Upper Cretaceous movements of the so called Laramide phase occurred in the Inner Carpathians, probably already without the formation of nappes (D. Andrusov 1958). The Mesostructure of the Inner West Carpathians arisen by the complicated development described was affected partly already in the Upper Cretaceous by intensive destructive subaerial processes. Namely nappe elements, above all the higher ones, were denuded to a considerable measure. The extent of the Pre-Paleogene destruction is shown by the sedimentation of the Central Paleogene direct on the Krížna elements, even also on the Hercynian elements (E. Mazúr 1963).

In contrast with it, in the Outer Belt of the West Carpathians the stage of geosynclinal development took place later than in the Inner Ones, the Mesostructure of the Outer Belt, thus, compared to the Mesostructure of the Inner Carpathians is shifted both spatially und chronologically. As to the shift of the geosyncline from the area of the Inner Carpathians to the foreland of the fringe of the Bohemian Massif, it occured substantially after the Mid-Cretaceous folding of the Inner Carpathians. In course of the Upper Cretaceous and Paleogene the geosyncline broadened regressively also to the area of the Klippen Belt (M. Maheľ 1960—1967). After the sedimentation of the Upper Cretaceous and of the Paleogene Flyschoid formations an intensive folding took place here with forming nappes of the so called Savian phase (D. Andrusov 1938, A. Matejka 1960). The folding movements of the Flysch Belt recurred also in course of the Miocene. This is suggested by the Flysch shifted up on the Lower-Miocene sediments in the foredeep of the Carpathians (D. Andrusov 1958, A. Matejka 1960). In the Klippen Belt as an intermediate zone between the Inner Carpathians and the Outer Flysch zone the Savian phase and the Intra-Miocene movements led to the rise of scaled structure.

The Mesostructure of the Inner Carpathians, in course of the development of that of the Outer Carpathians had a different development. Even here, it is true, sedimentation took place in course of the Paleogene, the later movements, which led to the nappe-fold structure of the Outer Belt, manifested themselves in the Mesostructure of the Inner Carpathians, however, preferably in a shape of free folds with a relatively great radius and accompanied partly also with faults. In course of the folds frequent axial elevations and depressions manifested themselves and thus the Inner Carpathians are marked for their touch

of brachyfold structure (M. Lukniš 1962, E. Mazúr 1962, 1963). The structure of folds, resp. of brachyfolds, was influenced to a considerable measure by the depths and character of elements of the Hercynian Paleostructure as a non-plastic hard element. In the area of the Slovenské Rudohorie Mts, where a relatively extensive block of paleostructures was situated relatively non-deep under the Alpine Mesostructure, a massive upwarp and undulation occurred. In contrast with it, in the Fatro-Tatrian area, where the elements of the Paleostructure were broken up into small blocks situated in various depths, these paleostructural blocks as hard elements became crystalline cores of anticlines accompanied with intrusions. With the paleostructural hard cores the axial elevations of fold arcs were connected probably. Also the rise of unilateral fault disturbances is linked to the blocks. As indicated by the distribution of the Old-Miocene sediments, the Intra-Carpathian basins still did not exist in present-day concept. The character of the West Carpathians was very different from the present-day mountain range. It is, however, probable that the beginnings of river pattern — we mean the major streams — are related with this phase of development of the West Carpathians.

A mighty volcanism was conditioned by the Post-Paleogene movements in some areas of the West Carpathians, namely especially in the area of subsided block within the present-day Central-Slovakian volcanites, resp. also in the background of the Intra-Carpathian block. In its course mighty masses with a stratovolcanic structure were agglomerated in the area of the Slovakian middle mountains and of the so called Inner Volcanic Arc.

In course of the Younger Neogene and Pliocene the relief of the West Carpathians situated in the so called phase of morphological development was denuded intensively, several phases of crustal movements occurring, which alternated with the phases of planation. As indicated by the distribution especially of the so called middle-mountain surface, which cuts down all older elements as down as the Baden-Sarmatian formations inclusively, the West Carpathians, in course of the Pannonian, were levelled to a cosiderable measure, probably with a character of flat middle-mountain relief. The planation of positive morphostructures was accompanied locally with sedimentation in depressions and in Sub-Carpathian basins (E. Mazúr 1965).

The further development of this flat middle-mountain surface of the West Carpathians was interrupted by an entire upwarp of the West Carpathians in course of the so called Rhodanian phase (l. c.). These movements were considerably differentiated and they totally changed, even may be said that they destroyed the Mesostructure both in the Inner and in the Outer West Carpathians. As indicated by the disturbances of middle-mountain surface, relative height differences reached in these movements frequently values of about 500—600 m and in interior part of the upwarp above 1000 m. When subsidence of negative forms, i. e. depressions and Sub-Carpathian basins considered, where an intensive sedimentation occurred, then these value are higher substantially. The major features of the present-day morphostructures of the West Carpathians, i. e. of the present-day mountain ranges and basins have been conditioned just by these movements (E. Mazúr 1964, 1963). Destruction of the middle-mountain Pannonian surface deformed in this way tectonically occurred due to subaerial erosion, which was conditioned to a considerable measure by lithological properties of rocks. The most intensive erosion took place, of course,

on the uplifting blocks, and the water streams removed material and accumulated it in adjacent depressions and Sub-Carpathian basins (so called gravel formations) (D. Andrusov 1954, 1958, 1959). On the contrary, less uplifted blocks were relatively moderately modelled by subaerial processes and the so called river level has developed on them, especially along the rivers and on the Neogene and Flysch rocks in basins. Marginal parts of the upwarp were frequently overlapped by the Upper Pliocene sediments. The development of river level took place also in the Old Pleistocene up to the Mindel substantially, when it was interrupted by a new, very intensive phase of movements, which further has emphasized vertical differentiation of the individual blocks of the youngest present-day morphostructure — the Neostructure. The Neostructure manifests itself most intensively in the Fatro-Tatrian area, very intensively also in the area of volcanites, whether in the Slovakian middle mountains, in the Lučenec-Košice depression, or in the Slaná-Matrian area. The present-day morphostructures of the volcanic area are not considered by us, therefore, as morphostructures formed by volcanic activity, but as i differentiated block structure. The mass of volcanic mountain ranges is volcanic, it is true, but as structures, they are Neoid, unevenly uplifted blocks. It is very probable that the Neoid structure has affected also the Outer West Carpathians by uneven movements of blocks, wherewith original Mesostructure has been destroyed to a considerable measure. The present-day Flysch high massifs are considered as Neoid block structures, too (e. g. the Levočské Vrchy Mts, Čerchov, Oravská Magura, Babia Hora, Pilsko, Javorníky Mts, the massif of the Biele Karpaty Mts etc.) and not as a formation of differentiated subaerial processes as it has currently come down in geological and geomorphological literature.

The major features of relief of the West Carpathians are a result of the Neogene, substantially Pliocene development. The major macroforms correspond subtantially to the so called neotectonic forms. The subaerial processes occurred epicyclically under a strong influence of tectonic movements, and the lithological-structural properties as well as the influence of climate have manifested themselves just only in the morphostructure.

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MORPHOSTRUCTURES OF THE WEST CARPATHIANS (ČSSR)
(Explanatory notes to annex)

Explanations

a) Boundary between the Carpathians and Pannonian basins
b) Boundary between the West and East Carpathians
c) Boundary between the Inner and Outer Carpathians
d) Boundary of the main morphostructural types in the frame of above mentioned morphostructural units
e) Boundary of basic macromorphostructural units
f) Stagnant Water
g) Rivers

1. Morphostructures of the Inner West Carpathians

   1. Semimassive morphostructure of the Rudohorie type
      1. Semimassive moderately upwarped block
      2. Basin
   2. Fold-fault blok morphostructure of the Fatro-Tatrian type
      1. Positive morphostructures: horst etc.
      2. Horsts of the Central Carpathian Flysh
      3. Negative morphostructures: grabens, morphostructural depressions — basins
   3. Volcanic block morphostructure of the Slovenské Stredohorie type
      1. Positive morphostructures: horsts and differentiated blocks
      2. Negative morphostructures: grabens etc. — basins
   4. Morphostructural depression of the Lučenec-Košice type
      1. Negative morphostructures — grabens
      2. Moderately positive morphostructures in the frame of depression
   5. Block morphostructure of the Slánske Vrchy-Matra type (Inner volcanic arc)
      1. Positive morphostructures — horsts

2. Morphostructures of the Outer West Carpathians

   1. Morphostructural depression of peri-Pieninian lineament (Klippen lineament)
      1. Negative and intermediate fold-fault and intricate structures
   2. Fold-fault structures of the Flysch Carpathians
      1. Positive block morphostructures
      2. Intermediate morphostructures

3. Morphostructures of intervening belt — transversal depression of the Nízke Beskydy
   1. Transversal depression through the Flysch Carpathians between the Sandomierz basin and Pannonian basin
   2. Positive morphostructural blocks
4. Morphostructures of the Inner East Carpathians
   1. Block structures of the Vihorlat-Gutin
5. Morphostructures of the Outer East Carpathians
   1. Morphostructural depression of peri-Pieninian lineament
   2. Positive morphostructural blocks
   3. Intermediate morphostructures of the Flysch belt
6. Morphostructures of Pannonian basins (hinterland)
   2. Moderately uplifted positive morphostructures in the frame of the Pannonian depressions

ЭМИЛ МАЗУР

ОСНОВНЫЕ МОРФОСТРУКТУРНЫЕ ЧЕРТЫ ЗАПАДНЫХ КАРПАТ

Западные Карпаты в общем представляют собой обширное, относительно плоское поднятие эллиптической формы. (Э. Мазур 1965). Эллипс Западных Карпат по своей окружности ясно ограничивается субкарпатскими депресиями — на внешней стороне Карпатским краевым прогибом, на внутренней межкарпатскими бассейнами. (Венский и Паннонский бассейны). Но на северо-востоке Западных Карпат границы не так ясны. Однако также там находится очень ясная депрессия в флишевой зоне (Низкие Бескиды) между Сандомерским бассейном и Восточнословацкой низменностью.

Весьма характерным признаком **западокарпатского поднятия** является окраинная внутренняя морфоструктурная расчлененность представленная мозаикой двух контрастных формаций — положительных и отрицательных морфоструктур (горные массивы — котловины). Высота над уровнем моря обеих противоположных морфоструктурных элементов увеличивается от окраины поднятия к максимуму внутри Западных Карпат.

Следующим признаком поднятия является его ассиметрия. Найвысшая точка поднятия находится в северовосточной части, только 90 км от окраины. Эта ассиметрия вероятно связана с горизонтальным сдвигом западокарпатской морфоструктурной единицы в направлении к северу, или северо-востоку и с ее подвигом над герцинские блоки Чешского массива, или Свентокрижского горного массива. Внешние окраины западокарпатского поднятия относительно острые с ясным краевым прогибом, который является следствием этого передвижения. Западный план западокарпатской морфоструктурной единицы, югозападная вплоть до южной части эллипса по морфоструктуре расчленена в виде растянутых пальцев, что вероятно связано с дислокациями растяжения движущейся Западокарпатской структуры.

Западокарпатское расчлененное поднятие разделено на два морфоструктурные элементы — на блок **Внутренних Карпат** и на аркаторную систему **Внешних Карпат.** Очень ясной морфологической границей между обеими морфоструктурами является почти соединенный пояс депрессий, соединенный по направлению к клипповой зоне. Это проявляется также как ясная граница глубинных структур, перипенинский шов. Он тянется по северной окружности Малых Карпат Средневажской долиной по северной окружности Фатры и Татр, где он проявляется не так ясно, но на северовостоке между Пенинами и Кошицкой котловиной, как и в Спишско-шаришском межгории опять ясно углубляется.

Для внутрикарпатского блока характерным является классическое развитие противоположных блоковых вплоть до складчатоблоковых структур неравномерно разложенных в форме мозаики. Пространственное разложение этих макро- и мезоструктурных элементов Внутренних Карпат не имеет признаки поясного строения и по современному морфоструктурному

плану его не возможно считать результатом складчатых, или подвиговоскладчатых процессов мезозоя или палеогена, а оно является результатом более молодых движений с преобладанием вертикальных движений. Дифференцированные неотектонические движения образовали здесь мозаику **положительных и отрицательных морфоструктурных форм.** Оси этих более молодых глыб до некоторой степени отличаются от осей складчатых движений, которые происходили прежде.

Внутренние Карпаты расчленяются на пять морфоструктурных типов: 1. тип Словацких Рудных гор, 2. тип Фатро-татранской структуры, 3. тип Словацкого среднегория, 4. тип Луценско-кошицкой депрессии и 5. тип Словацко-матранской аркагорной системы.

Система Словацких Рудных гор представляет собой самый древний элемент Западных Карпат с ясными признаками варийского тектогенезиса. Является относительно спокойным блоком, в котором в настоящее время происходит внутренняя дифференциация скорее в виде экзогенных процессов, чем в виде процессов тектонических и охарактеризован неогеновым выравниванием поверхностей.

Фатро-татранская структура обозначена рядом мелких кристаллических элементов — ядер — и более молодых складчатых элементов в форме положительных морфоструктур с одной стороны и с другой стороны отрицательными морфоструктурами с осадочными формациями палеогена и неогена. В Фатро-татранской морфоструктуре различительные тектонические движения достигают максимума. **Структура Словацкого среднегория** по большей части основана вулканическими массами в покрове старших элементов, местами и неогеновых отложениях и характеризуется интенсивной структурой разломов с неровномерным падением глыб. Современные макроформы являются результатом не вулканизма, а неотектонического движения глыб. **Луценско-кошицкая депрессия** представляет собой комплекс макро- и микроструктур, обусловленных отрицательными движениями по юговосточной окружности блока Рудных гор.

Последным морфоструктурным элементом Западных Карпат на границе с Паннонским бассейном являются положительные горстовые структуры, связанные с внутренней сопочной дугой. Хотя и это касается вулканических масс, опять надо подчеркнуть что как макроформа **Сланско-матранская область** обусловленна положительными движениями глыб.

Внешние Западные Карпаты по сравнению с Внутренними Карпатами характеризуются поясным строением и менее выразительной внутренней структурной пестростью. По своему возрасту и морфоструктуре различаются **перипенинский шов** (относительно узкий) и **собственная флишевая зона.** Хотя и перипенинский шов в основном имеет антиклинориальную структуру, с точки зрения морфоструктуры проявляется как структура выступающая в депрессии, о чем ясно свидетельствует его морфологический характер. Внешняя флишевая зона обозначается надвиговоскладчатой структурой — но она сильно разрушена неравномерными блоковыми движениями. Хотя и традиционно высокие флишевые массивы считаются результатом избирательных селективных эрозионных процессов, было обнаружено достаточное количество фактов что этот процесс касается положительно движущихся глыб, морфологическая характеристика которых подчеркнута устойчивостью горных пород. Развитие противоположных отрицательных и положительных форм в флишевых Карпатах издалека не достигает такой интенсивности, как во Внутренних Карпатах, что в основном обусловлено прежде всего отличными физикальными свойствами флишевого основания (более высокая пластичность).