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EPIQUASIPLATFORM FEATURES OF THE CENTRAL WEST CARPATHIANS

Abstract: Tectonic evolution of Paleoalpine stage ended in Central West Carpathians by formation of stabilized units which were nevertheless confined in time as well as in space. The surface development of the stabilized units took place mostly in the conditions of monsoon climate, while in a time span of approximately 58 million years the not very rugged nappe relief was changed into a regionally extending levelled surface. At the onset of the neotectonic stage in the evolution of the crust, the relief of Central West Carpathians was probably in a progressing stage of levelling.

Резюме: Тектоническое развитие палеоальпийской стадии окончилось в Центральных Западных Карпатах образованием стабилизированных единиц, которые были ограничены во времени и пространстве. Развитие поверхности стабилизированных единиц проходило преимущественно в условиях муссонового климата, причем в течение периода приблизительно 58 миллионов лет этот не очень расчлененный рельеф покровов переобразовался в регионально распространеную поверхность выровнивания. Во время начала неотектонического этапа в развитии коры был рельеф Центральных Западных Карпат правдеподобно на больших пространствах во высокоразвитой стадии нивелизации.

Introduction

In the presented paper we use the division of the West Carpathian System into three parts — External, Central and Internal West Carpathians — which appears to be a more natural one, from the viewpoint of morphotectonics and morphogenesis, than the division into two parts, only into External and Internal Carpathians.

The beginning of the Neoid geomorphologic stage of West Carpathians can be set at the boundary of Middle and Upper Cretaceous, or to the beginning phases of Upper Cretaceous (Činčura, 1987). The first known evidence of subaeric evolution from this period are the signs of lateritization verified in the Slovak Karst. They are older than the Santonian—Campanian black schists that form the filling of karst cavities (Mello — Snopková, 1973), thus they are probably of Lower Senonian to Coniacian age.

An important fact is the ending of the sedimentation by flysch in Paleoalpine Central West Carpathians already in Cenomanian (Mahel', 1978), or in some places already in Turonian, basically without a gradual ceasing of sedimentation in typical molasse basins, as it was the case e.g. in the Neoalpine stage.

The mentioned facts indicate that in paleogeographical and paleogeomorphological reconstructions we must consider the dry land of Central West Car-

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pathians in Upper Cretaceous, but neither should we neglaect the Gosau developments. On a part of the dry land of Central West Carpathians, subaeric development took place for approx. 35 million years in the Paleoalpine stage of Upper Cretaceous.

Not every cessation of tectonogenesis means necessarily a transition to a platform regime. The development in Central West Carpathians however indicates that the Paleoalpine folded structures were developing in this direction. On the basis of the insubstantial development of Cretaceous, although it cannot be excluded that it could be only the relics of a larger basin, Maheľ (1979) came to the conclusion that cratonization took place in Central West Carpathians.

According to Roth (1980), the Subhercynian phase, which already structurally individualized the Alpine part of the Epivariscan Europe from the forefield, ended with a reconsolidation, while this reconsolidation created the Epipaleoalpine quasi-platform from components of various origin.

Tectonic development of the Paleoalpine stage thus resulted in Central West Carpathians in the formation of stabilized units. The inequality of the Epipaleoalpine consolidation is indicated after all also by the developments of Paleogene, which differ from each other on the north and on the south of the quasi-platform.

The Epipaleoalpine quasi-platform of Central West Carpathians of course cannot be put equal with typical platforms, nor with young Epivariscan platforms, not only from the viewpoint of the length of its existence but also from the viewpoint of its stability and extent. It was a more lively and mobile structure, more prone to regeneration and activation, even though it contained as well fragments of the former Epivariscan platform, e.g. the Tatride block.

The surface development of the platforms — Proterozoic as well as younger ones, e.g. Epivariscan — tends, even before the sedimentation of platform mantle, towards a pronounced levelling of the basement relief (Belousov, 1962; Timofeev, 1979). Whether similar rules apply in the case of the development of the quasi-platform basement relief will be attempted to analyse in the following on the basis of relief development of Central West Carpathians in Upper Cretaceous or Paleocene and Lower Eocene.

The evolution of the Central West Carpathian relief during Upper Cretaceous cratonization (Maheľ, 1979) or reconsolidation (Roth, 1980) can be estimated only on the basis of some indirect indicators. In any case it is necessary to admitt that subaeric relief started to develop on the surface of the quasi-platform basement. The hypothetical Upper Cretaceous relief of the quasi-platform basement can be described as a product of an interference of tectonics and climate. Paleoalpine tectonics conditioned the forming of primary Central West Carpathian relief represented my nappe morphostructures before Senonian. In these morphostructures, the different resistance and geomorphological value of rocks was probably reflected as well. A more detailed morphosculptural modelling of the quasi-platform basement surface during Upper Cretaceous was a result of the activity of exogenetic relief-forming processes on the nappe relief and it was controlled by tectonics and climate.

Upper Cretaceous evolution of the Central West Carpathian relief

Tectonic control of the relief development

The hilly or maybe in places also sub-upland character of the basement relief is indicated by the fact that not all basement was flooded by the extensive Upper Cretaceous transgression; an evidence of this are the only less important occurences of Upper Cretaceous sediments in Central West Carpathians. In the case of a low-lying near-shore flatland the extent of Upper Cretaceous transgression in Central West Carpathians would be much greater.

After stating the assumptions on the basic traits of the Upper Cretaceous quasi-platform basement relief in Central West Carpathians there appears the question about the result of the subaeric development during Paleoalpine stage from the viewpoint of geomorphology: whether the Paleoalpine evolution cycle did at all produce a mountain range in the geomorphological sense, i.e. a convex unit of large dimensions with highland or upland character separated from the neighbouring lower parts by a pronounced foot. At least a partial answer to the question formulated in this way can be given on the basis of the development of Upper Cretaceous sediments in Central West Carpathians.

The rise of a mountain range — orogenesis* — in geomorphological sense of the word, caused by a general uplift of a certain territory and its subsequent division predominantly by the activity of consequent streams, is accompanied by formation of a large quantity of correlate sediments on the forefield of the growing mountain range. A typical orogenic regime, e.g. of the neotectonic stage, is accompanied by formation of basins, the characteristic rock formation of which is molasse. A wider development of molasses accompanied for example also the Variscan tectonogenesis, or the neotectonic stage of the Alpine tectonogenesis.

As already mentioned above, Paleoalpine stage in Central West Carpathians ended mostly by the sedimentation of Cenomanian, or Turonian flysch. This means that conditions favourable for the formation of extensive molasse basins probably did not exist during subaeric development of Central West Carpathians after Cenomanian or Turonian. We think it very improbable that molasse basins of this era should be without trace destroyed by erosion during the tectonically calm period of Early Paleogene. On the basis of this fact it is possible to assume that in Upper Cretaceous the Paleoalpine cycle did not end by the formation of a mountain range — i.e. at least of midmountains of upland character. Such an assumption is supported also by the character and thickness of some known continental sediments from the end of Paleoalpine stage, or from the subsequent period of relative calm lasting in Central West Carpathians until the onset of the neotectonic stage.

The profile throug continental sediments known from the borehole GK-4 near Bzovík (Campanian—Maastrichtian to Rupelian), i.e. from the time

* By the term "orogenesis" we understand the elevation and formation of a mountain range in the sense of Haarmann (1930), in contrast to folding (tectonogenesis), which is not necessarily connected with morphologic formation of a mountain range.

from 70 to 33 million years, indicates that the rate of sedimentation was 0.14 cm/100 years (Vass — Čech, 1983).

During Upper Cretaceous and Paleocene, a detrital formation composed of breccias and conglomerates, interbeds of fresh-water limestones, variegated clays, sandstones, interbeds of washed laterite rocks, sedimented in the eastern part of the Small Danube Lowland. The material comes from the surrounding denuded land, while the greatest thickness (west of Obid) of variegated mantle rocks between the basal Upper Cretaceous and the overlying Lower Eocene is 190 m (Seneš in Andrusov, 1965). In the case when the sediments should represent the whole period of almost 30 million years, the rate of sedimentation would be also relatively low.

Both abovementioned "molasses" are noted for their lowest average sedimentation rates known in Central West Carpathian molasses of Paleoalpine as well as Neoalpine stages. In comparison with the rate of sedimentation of Badenian molasses, i.e. molasses of the orogenic period of the neotectonic stage, (10.9 cm/100 years in the East Slovak Basin, 5.5 cm/100 years in the Vienna Basin and 7.8 cm/100 years in the Galanta Basin; Vass — Čech, 1983), it is a several tens times lower sedimentation rate, which cannot be attributed to orogenic regime of a rising Paleoalpine mountain range, but rather to the period when vertical tectonic movements ceased, i.e. to the so--called calm period following the Laramian movements on the basement of the Epipaleoalpine Central West Carpathian quasi-platform.

On the basis of the mentioned reasons, the Paleoalpine cycle can hardly be considered orogenic, or attributed with an orogenic regime. The primary nappe relief, according to present knowledge, also did not have the character of a mountain range, but rather of a hilly region. Neither did the relief formed on it by erosion and denudation fulfill these criteria.

Climatic control of the relief evolution

The recent territory of Central West Carpathians, belonging to the temperate climate (approx. 49 °N), lied in Upper and Middle Createaceous in a climate zone transversed by the 20° or 24° of northern latitude (Činčura, 1987). The climate of the beginning of neoid geomorphologic stage, determined by the situation of the microcontinent Kreios in sub-equatorial, or tropical zone, was characterized by high average annual temperatures and slight temperature variations during the seasons of the year. The summer monsoon provided ample precipitation not only to the southern coast of Fennosarmatia, but also to the tectonic relief of the microcontinent lying in the northern part of the Tethyde ocean. Pressure conditions changed in the winter season and dry air masses flowed over the microcontinent from Fennosarmatia to the ocean. In the above described climatic conditions, processes of profound and intensive weathering took place on the microcontinent. Their product was the formation of tropical karst and the lateritization of limestones in the Slovak Karst (Mello — Snopková, 1973) belonging to Upper Cretaceous.

It is probable that weathering crusts, remnants of which are the recent occurences of bauxites in West Carpathians, started to form in Upper Cretaceous. Owing to the conditions of their formation in the decomposition sphere of the tropical zone of the microcontinent, certain analogies can be found, as far as the genesis is concerned, between the Carpathian bauxites and recent laterites, which almost always occur on recent or fossile levelled surfaces, or in cracks of their decomposition spheres (B ü d e l, 1977).

A detailed morphosculptural modelling of the quasi-platform basement in Upper Cretaceous had as a consequence probably the smoothening of some unevenesses of the existing hilly relief. A levelled surface started to form developing further on the quasi-platform basement even after the end of the Paleoalpine stage. The abovementioned development of weathering crust indicates that the trend of the Epipaleoalpine quasi-platform surface evolution can be in part compared with the evolution trend of basement surfaces of Epivariscan or older platforms, in the sense of B e l o u s o v (1962), or T i m o f e e v (1979).

We consider it convenient to class the Upper Cretaceous development of West Carpathians as quasi-platform, not only from the viewpoint of tectonics, but also of geomorphology. Quasi-platform evolution went on in Central West Carpathians even after the end of the Paleoalpine cycle, i.e. after Laramian phase, in Paleocene and a part of Eocene, or until the beginning of neotectonic stage. A more precise determination of the time of the end of quasi-platform evolution will be the object of a separate study.

A considerable importance from the viewpoint of the subsequent evolution of the West Carpathian qausi-platform basement relief have the effects of Laramian stage which ended the Paleoalpine stage.

Paleocene—Lower Eocene evolution of Central West Carpathian relief

T e c t o n i c c o n t r o l o f r e l i e f e v o l u t i o n

The uplift of the territory where Nízke Tatry Mts., Veľká Fatra Mts. and Spišsko-gemerské rudohorie Mts. are situated in the present time took place only after Laramian phase (G r o s s — K ö l l e r et al., 1980). Continental regime dominated in the beginning of Paleocene also on the rest of the territory of the Central West Carpathian quasi-platform basement and it continued until Lutetian, or Priabonian transgression.

Only the northern part of Central West Carpathians, less stabilized in Epipaleoalpine stage, became in this time a part of sedimentation space. An evidence of this is also the Paleocene age of near-klippen Paleogene formations transgressing for example also on the northern slopes of Malé Karpaty Mts.

No evidence of a more marked deformation, either in Paleocene or Lower Eocene, can be found inside the quasi-platform basement. This is after all evidenced also by the thickness of basal lithofacies. The cone sedimentation of the Kľuknava Formation was perhaps the reaction to a tectonic uplifting of a part of the quasi-platform basement (Nízke Tatry Mts., Veľká Fatra Mts., Spišsko-gemerské rudohorie Mts.). The mentioned cone sediments on the basement of Eocene formation are assumed to be of Paleocene age. The absolute age of the uplift of the territory of present Nízke Tatry Mts., 52—37 million years (K r á ľ, 1977), is however Eocene, i.e. the cones in the Kľuknava Formation, understood as correlate sediments to this uplifting, should be rather of Eocene age.

The question about the time of uplifting of Nízke Tatry Mts. to their present form can be considered not completely solved. Paleogene uparching, even though its amplitude still has to be estimated, is evidenced no only by the data of Kráľ (1977), but also by the character of Central West Carpathian and Budinian Paleogene sediments, the developments of which were separated also by the elevation of Nízke Tatry Mts.

An open question remains, what role in the uparching of Nízke Tatry Mts. can be attributed to the Neogene period. Neotectonic evolution of West Carpathians started, according to Kvitkovič — Plančár (1979), in Upper Badenian. Intensive elevation of Nízke Tatry Mts. in Badenian or also in the subsequent Sarmatian, would, however, necessarily cause molasse sedimentation in the neighbouring basins, especially in the present Liptov Basin and Horehronské Valley.

Miocene sediments are completely absent in Liptov Basin. Quarternary alluvial cones and river terraces lying over the Paleogene sequence are correlate sediments to the younger uplifting of Nízke Tatry Mts. On the basis of correlate sediments, the Paleogene and Quarternary uplifting of Nízke Tatry Mts. can be considered proved. Correlate sediments indicate not only a two-stage development of the mountain range elevation, but also at the same time that in Neogene was the uplifting probably less important.

Nor in the Horehronské Valley are there any important accumulations of Miocene molasses which would indicate, for example, similar uplift amplitudes as we would assume, on the basis of the Turčianska Basin filling in Badenian, Sarmatian and Pannonian, for Malá Fatra or Veľká Fatra Mts.

Tectonics of the Laramian phase did not break the quasi-platform basement into a system of horsts and grabens. There is no evidence for that. Whether we accept the Paleocene or Eocene age of the cone sedimentation in the Kľuknava Formation or not, in any case we can suggest that these cones did not full any tectonically restricted graben-like depression, but probably they were prolluvial sediments sedimenting on the foot of the uparching part of the quasi-platform basement, through which episodic as well as permanent streams flowed to the not very distant sea shore.

The quasi-platform regime lasted in Central West Carpathians during whole Paleocene (17 million years), as well as a part of Eocene, until Lutetian or Priabonian (approx. 6 million years), meaning approx. 23 million years of evolution after Laramian phase, in the so-called calm period. The period of relative calm is evidenced also by reef sedimentation during Paleocene.

The not very rugged Upper Cretaceous nappe relief was during all of this period exposed to destruction. The effects of subaeric destruction, with no important tectonic activity, enhanced the levelled features of the Central West Carpathian quasi-platform basement.

Climatic control of relief evolution in Paleocene and Lower Eocene

The Central Carpathian part of the microcontinent Kreios, or the system of Insubric-Carpathian blocks, was after Laramian phase situated roughly on both sides of 30° of northern latitude (Činčura, 1987). The position of the microcontinent means that exogenetic processes on the quasi-platform basement took place at high average annual temperatures over the continent as well as over the neighbouring sea. Annual precipitation had azonal character and it was controlled by summer monsoons, which brought humid oceanic air to the continent with lower air pressure.

The suggested tectonic and climatic conditions — relative tectonic calm until Illyrian phase, high average annual temperatures and regular ample precipitation during summer monsoon — indicate that the not very rugged Upper Cretaceous tectonic relief was submitted to further levelling during the so--called calm period.

Weathering processes and levelling of the quasi-platform basement surface during the calm period of Paleocene and a part of Eocene were undoubtedly differentiated on the various types of limestones, dolomite limestones and dolomites occuring in pebbles of the basal transgressive lithofacies. The purity of limestones controlled the course of karst processes on the quasi-platform basement surface. Some of the karst phenomena from the period before Eocene transgression are described by Gross — Köhler et al. (1980) in the Liptov Basin. Karst phenomena are however typically developed also in the Malé Karpaty Mts. in the period before the transgression.

The origin of some relief denivelizations which existed on the permanently developing, levelled surface of the quasi-platform basement in places formed by carbonate strata, can be probably attributed to the differentiated karst processes, in which, except karst depressions, positive forms of karst relief were undoubtedly formed as well.

Negative karst forms described near Mojtín (Andrusov, 1965), or in Liptov Basin (Gross — Köhler et al., 1980) were probably very frequent of the quasi-platform basements. We can however assume also the existence of positive forms of karst relief between karst depressions — high limestone mogotes. These have not been preserved in their original form until present time. Nevertheless, we know the occurences of their fragments or remnants on several locations in West Carpathians.

We consider the fragmental to boulder material falling from the steep walls of mogotes an important source not only of the so-called pre-transgression sediments of Central West Carpathian Paleogene, but also, after rounding by the waves of the transgressing sea in littoral zone, of breccias and conglomerates of the basal transgressive lithofacies described as the Borove Formation (Gross — Köhler — Samuel, 1984).

The result of deep tropical weathering, the beginning of which can be placed already into Upper Cretaceous and which continued during whole Paleocene and a part of Eocene (i.e. it lasted approx. 35 + 17 + 6 = 58 million years), was with greatest probability the formation of a regionally extending levelled surface on the basement of Central West Carpathian quasi-platform. On the basis of the present knowledge on petrographical composition of the Borové Formation, or conglomerates of Eocene basal lithofacies, with prevailing pebbles of limestones and dolomites, the levelled surface of the quasi-platform basement cut down especially the rocks of Mesozoic nappes and paraautochthonous succesions. The depth of the downcutting on the majority of the territory probably did not reach rocks of crystalline complexes. However, exceptions did exist, which show also the sediments of the Kľuknava Formation, containing rocks of crystalline complexes.

In some places the development of levelled surface was interrupted in Lutetian, elsewhere only in Priabonian. The area of the present West and High Tatra Mts. (Západné Tatry and Vysoké Tatry Mts.) represented in that time a hilly region formed on the surface mostly by Mesozoic rocks and in the end of Lutetian washed on the north, west and east by a shallow sea. This hilly region was completely covered by sea only in Priabonian (G r o s — K ö h l e r et al. (1980). Vysoké Tatry Mts. were in Upper Badenian still covered by flysch strata, probably by their uppermost members (C h m e l í k in B u d a y et al., 1967).

Eocene sea was advancing on the quasi-platform basement of Central West Carpathians from two directions. Simultaneously with the transgression from the south, an extensive transgression was advancing from the north and north-west (G r o s s, 1983).

The fact that Eocene sea penetrated on the Central West Carpathian quasi-platform basement after almost 58 million years, or, in places, after a longer period of subaeric evolution, was made possible not only by the subsidence of this temporarily stabilized unit, but also without doubt by nivelization of the quasi-platform basement relief, which attained probably a very advanced stage. The subsidence of the quasi-platform basement was gradual. An evidence of this are the data of K ö h l e r — G r o s s et al. (1980) on the advancement of the sea. The sea advanced approx. 20—40 km onto the continent in Upper Lutetian and another 5—15 km in Priabonian.

Some of the so far calculated data on the speed of subsidence of Paleogene basins indicate that the subsidence of the quasi-platform basement and the sedimentation of the basal lithofacies on the levelled surface were not everywhere regular.

On the basis of data from Hornonitrianska and Liptov Basins, as well as Hornád Basin, a lower rate of sedimentation of basal lithofacies is mentioned for the peripheral parts than in central parts, but much lower sedimentation rates of basal lithofacies than of younger ones, i.e. of clays or flysch (S a m u e l — F u s á n, 1982), indicating a gradually accelerating colaps of the Epipaleoalpine quasi-platform basement, as well as the extinction of the regionally extending levelled surface of Central West Carpathians.

The fact that the material of basal lithofacies is in many places not differentiated either facially or petrographically can be explained by the absence of greater differences in the relief of the source regions of the basal lithofacies.

Considering the fact that the thickness of the basal lithofacies as a rule in any place of the quasi-platform basement does not exceed 200 meters (on the basis of the results of geological mapping and geophysical survey in Liptov Basin, the thickness of the basal lithofacies varies from several meters to hundred meters, sporadically up to 120 meters), denivelizations of the surface could not as well exceed this height difference. That means that the relief of Central West Carpathians during the Eocene sea transgression had the character of a hilly region.

The sedimentation of basal lithofacies on the regionally extending levelled quasi-platform basement relief ment an end of subaeric regime on greater part of Central West Carpathians. Sedimentation continued by higher members with flyschoid or typical flysch character. Only the elevations in the area of Nízke Tatry Mts., or a part of Slovenské rudohorie Mts., remained probably unflooded by the transgressing sea (G r o s s — K ö h l e r et al., 1980).

Several tens of meters to over thousand meters thick sedimentary mantle sedimented gradually on the regionally extending levelled surface of the Epipaleoalpine quasi-platform basement. This was probably not only a matter of formation of surface depressions, because, as a rule, larger depressions are connected with thinning of continental crust (M a h eľ , 1978).

From the viewpoint of geomorphology, this sedimentary mantle, until its destroyment (in places it was preserved until present) which is connected with various periods of the neotectonic stage, became the conserving factor of the levelled surface of the Central West Carpathian Epipaleoalpine quasi-platform basement. The present remnants of the levelled surface of the quasi--platform basement play an important role, as they are the surface from which the denivelization of the relief, caused in Central West Carpathians by the neotectonic stage, should be derived.

The process of division of the Epipaleoalpine quasi-platform into blocks can be roughly compared with the activation especially of young, Epivariscan platforms, more susceptible to activation than old platforms, due to their greater mobility and a more lively structure. Activation of platforms is a process accompanied mostly by the elevation of earlier levelled blocks. The activized zones acquire at the same time orogenic, epiplatform character. We assume that a similar evolution took place also during the activation of the Epipaleoalpine quasi-platform of Central West Carpathians.

After the sedimentation of Eocene basal clastic rocks, composed mostly of strictly local carbonate material of nappes or paraautochthonous succesions, the material of the source regions changed and in flysch sandstones clastic fragments exclusively from crystalline complexes can be found (C h m e l í k in B u d a y et al., 1967). A marked change in the composition of the material indicates that the relief, owing to the effects of the Pyreneeian phase, began to change into a more rugged one, with more marked height differences.

Conclusion

In connection with the type of development a mountain range underwent before orogeny, mountain relief can be classified in present as epiplatform or epigeosynclinal. Orogeny is the result of an increased activity of vertical movements in the neotectonic stage.

Epiplatform mountain ranges are noted for a long period of platform evolution between the time of folding and the orogeny. A typical epiplatform orogeny as a rule takes place on a region of regionally extended levelled surface. Its remnants are preserved in an epiplatform mountain range in various height levels.

For epigeosynclinal mountain ranges it is typical that there is no interruption between the time of folding and orogeny. If folding and orogeny are not partially synchronic processes, they follow intermediatelly one after another. West Carpathians are mostly considered a typical epigeosynclinal mountain range. K v i t k o v i č — P l a n č á r (1979) consider West Carpathians in their present form to be a young mountain system formed in the neotectonic stage of the Earth crust evolution, following geosynclinal stage. D e m e k — Z e m a n (1979) consider Inner West Carpathians — a synonym for Central West Carpathians — to be an epigeosynclinal disrupted fold mountain range with a polygenetic relief.

However, if we attempt to class Central West Carpathians according to the existing classification scheme, they do not fulfill the conditions either of epiplatform, or epigeosynclinal mountains. The stage of orogeny in Central West Carpathians did not follow immediately after the period of folding and nappe displacement. We suggest to term the evolution in Central West Carpathians between the period of folding connected with the displacement of nappes and the neotectonic stage as quasi-platform development and the period of development between Paleoalpine and neotectonic stage which roughly coincides with Neoalpine stage, as quasi-platform period. The duration of the quasi-platform period can be estimated roughly at 58 million years, while quasi-platform development lasted longer on areas not flooded by the Eocene transgression.

The mentioned facts support the necessity to give increased attention in morphogenetic and morphostructural classification of mountain ranges, except to typical epigeosynclinal and typical epiplatform mountains, also to units with mountain relief where a shorter or longer quasi-platform interruption in the morphotectonic evolution has been confirmed, especially within one geotectonic cycle.

A typical example of a mountain range with quasi-platform evolution between Paleoalpine and Neoalpine stage are Central West Carpathians. Central West Carpathians thus show a difference in historical development of the relief from epigeosynclinal as well as from epiplatform mountains. They are a type of mountain range which we consider necessary to differentiate, with regard to mountain ranges of Alpine folded Eurasian zones, as a third type, termed "epiquasiplatform mountain range".

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