

TADEÁŠ CZUDEK

## PLANATION SURFACES OF THE CZECH HIGHLANDS

The Czech Highlands situated in the western part of Czechoslovakia have the shape of an extensive quadrangle and cover 51.9 % of her area. Geologically, they correspond to the Czech Massif built predominantly of schists with granitoid intrusions. Of younger formations Permocarboniferous, Cretaceous, Tertiary and Quaternary (mainly Pleistocene) deposits and young volcanites can be found here. The relief of the Czech Highlands is very complicated and various relief types (e. g. basins, hilly lands, highlands, mountains) alternate here on a small distance having various deep incised valleys, more or less distinct marginal and inner often fault-controlled slopes, and a flat relief of watersheds consisting of erosion flats as well as broad ridges of the planation surface on which often monadnocks, outliers and volcanic cones surmount.

In the Czech Highlands (highest mount being Sněžka — 1602 m in the Krkonoše Mts.) several basic types of planation surfaces occur exhibiting a various area and originated in different periods. These are: the exhumed pre-Cretaceous surface of planation, the Paleogene surface of planation, the Neogene planation surfaces and the surfaces of planation of Pleistocene age.

The exhumed pre-Cretaceous surface of planation is preserved in a narrow stripe at the edge of the Czech Plateau built of Cretaceous deposits and occupies a lower position than the surrounding summit flats of the Paleogene planation surface. In places Cretaceous residual hills can be found. The surface mostly lost its pre-Cretaceous weathered profiles and was often almost completely destroyed by younger erosion so that — as a matter of fact — a completely new surface developed. The author is of the opinion that its exhumation took place mainly (at least in the first phases) by pedimentation processes after the origin of the Paleogene levelled surface, i. e. mainly in the Neogene.

The surface of planation (by its origin of Paleogene age) covers largest areas in the Czech Highlands. It consists of summit flats (often almost horizontal with an angle of slope of less than  $1^\circ$  and an area of even more than  $3 \text{ km}^2$ ) and of widely rounded watershed ridges levelling rocks of various resistance and age. These forms occur in altitudes approximately between 350 and 1400 m. The height differences among the flats range within a region from 10 up to more than 100 m on a short distance, even between adjacent flats. But among the various relief types the differences are even several hundreds of metres owing to differential neotectonic uplifts. Above the level of the flats and ridges isolated elevations are rising mostly consisting of more resistant rocks. In granite regions, mainly in the Zúlovská pahorkatina (Hilly land) in Northern Moravia typical inselbergs can be found.

On the flats and broad rounded ridges of the Paleogene surface of planation remnants of fossil products of weathering occur as a result of intensive chemical weathering in warm climate mostly before the Badenian as well as weathering

products of Pleistocene age or even young sediments. On some flats and broad ridges both types mentioned of weathering products occur but mostly especially in the marginal parts of geomorphological regions only a periglacial 1–2 m thick weathering mantle can be found. The remnants of fossil deep weathered profiles exhibit on the summit surface a strongly varying thickness ranging between 1 m and more than 10 m. These weathering products reach their greatest thicknesses (as much as about 100 m) in depressions mainly in places where they are covered with younger Tertiary and Pleistocene deposits (e. g. in the Podkrušnohorské pánve Basins). In this case a buried Paleogene surface of planation is concerned. Rather thick fossil weathering products are preserved also below basalt effusions.

The Paleogene surface of planation was strongly remodelled so that in many areas practically nothing kept preserved of it. From the surface an extensive stepped topography of tectonic blocks developed on which small height differences among the erosion flats originated owing to various depths of the weathering front and local geomorphological conditions in the course of irregular denudation of the surface by back- and down wearing (T. Czudek 1963, pp. 148–149). In the modelling of this surface even the abrasion of the Miocene sea played a role in the eastern part of the Czech Highlands mainly in deep fossil weathering products. The remodelling of the planation surface described took place in various climamorphogenetic regions and culminated in the Upper Pliocene and in the Pleistocene. A more or less exhumed pre-Miocene weathering front and in many places the planation of its bedrock are concerned here.

The Neogene planation surfaces began to develop in the time when the planation surface mentioned above was modelled. They form mostly one up to two niveaux of flats and broad rounded ridges in a narrow stripe along larger valleys. In depressions and on margins of some geomorphological regions these surfaces cover large areas. A strong prevalence of Pleistocene periglacial products of weathering is typical of these surfaces. The surfaces described have the character of pediments developed mainly in the periods Sarmat-Pliocene. Their present position is controlled by young tectonics so that they occur in some areas in a higher altitude than the older Paleogene surface of planation.

The surfaces of planation of Pleistocene age occur in the Czech Highlands both as cryopediments and erosion glacis and as cryoplanation summit flats. Cryopediments can be found at the foot of valley sides, slopes of river terraces and at the foot of the marginal slopes of geomorphological regions. Mostly one or two cryopediments occur attaining in dependence on local geological and geomorphological conditions widths between several tens of metres and 2 km. They are often buried by Pleistocene slope deposits. The cryoplanation summit flats well known e. g. of J. Demek's paper (1969, pp. 1–80) are typical especially of mountainous regions of the area described where they often replaced the original older surface of planation.

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ТАДЕАШ ЧУДЕК

## ПОВЕРХНОСТИ ВЫРАВНИВАНИЯ ЧЕШСКОЙ ВОЗВЫШЕННОСТИ

В Чешской возвышенности развито несколько основных типов поверхностей выравнивания: откопанная домеловая, палеогеновая, неогеновые и плейстоценовые поверхности выравнивания.

Откопанная домеловая поверхность выравнивания тянется узкой полосой по краю Чешского плато, сложенного из меловых пород. Она была откопана главным образом путем педиментации в неогене.

Палеогеновая поверхность выравнивания занимает в Чешской возвышенности самые большие площади и представлена отдельными участками с высотами преимущественно от 350 до 1400 м. Выше уровня плато и хребтов поднимаются изолированные возвышенности. На этой поверхности находятся остатки древних кор выветривания, образованных интенсивным химическим выветриванием в теплом климате во время до бадена, и плейстоценовые коры выветривания. На некоторых отдельных участках палеогеновой поверхности находятся оба типа кор, на большинстве только периглациальные выветренные породы мощностью 1—2 м. Базальные горизонты древних кор выветривания имеют мощность от 1 до 10 м. Самые большие мощности этих кор обнаруживаются в депрессиях, где они перекрыты более молодыми осадками.

Палеогеновая поверхность выравнивания была после её возникновения так сильно изменена, что в современном рельефе на больших пространствах почти не сохранилась. На её месте сформировалась плоская водораздельная поверхность, имеющая различную высоту в пределах отдельных тектонических блоков. Небольшая высотная дифференциация поверхности плато и широких вершин хребтов возникла в результате неравномерной денудации в зависимости от мощности древней коры выветривания и локальных геоморфологических условий. По сути дела, современная поверхность выравнивания представляет откопанную, а местами и значительно денудированную базальную поверхность выветривания домиоценового возраста. Развитие этой поверхности выравнивания проходило в разных клима-морфогенетических условиях и было завершено в конце плиоцена и в плейстоцене.

Неогеновые поверхности выравнивания, формировавшиеся в то время, когда палеогеновая поверхность моделировалась, образуют один или два уровня в узком поясе вдоль больших долин. В депрессиях и на периферии некоторых геоморфологических районов они занимают довольно большие площади. Эти поверхности имеют характер педиментов, которые сформировались во время сармат-плиоцен.

Плейстоценовые поверхности выравнивания представлены в Чешской возвышенности криопедиментами и эрозионными гласисами а также нагорными террасами на вершинах хребтов, выработанными процессами криопланации.