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NATURAL CONDITIONS OF THE JABLONKA CATCHMENT AND ITS ANTHROPIC TRANSFORMATION

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The aim of the contribution is to characterize the natural conditions of the Jablonka Catchment with a special regard to its liability to the runoff geomorphic processes, as well as to evaluate the historical evolution of its anthropic transformation. The author deals with individual stages of the settling the study area and with collectivization in farming and outlines the general statements concerning the geomorphic responses to land use changes, namely the regularities of the spatial distribution, course and medium-term geomorphic effect of the runoff geomorphic processes.

Key words: natural conditions, liability to geomorphic processes, runoff geomorphic processes, "kopanitse" colonization, collectivization in farming, anthropic transformation, geomorphic effect, land use changes, geomorphic response

INTRODUCTION

The Institute of Geography of the Slovak Academy of Sciences participates in the solving of the joint Israeli-Slovak-Czech project "The Response of Fluvial Systems to Large Scale Land Use Changes", planned for the years 1993-1997. The main objective of this project is to evaluate the nature of geometrical land form changes as well as changes in spatial distribution, course, intensity and effect of geomorphic processes provoked by operation of surface runoff /or in other words the runoff geomorphic processes - the term introduced by Stankoviansky (1995a)/ as a response

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to the large scale land use changes, connected with collectivization in farming. The Slovak part of the international project team studies mentioned topic on example of the Jablonka catchment, representing in fact the uppermost part of the Dudváh Basin.

The aim of this contribution is to characterize the natural conditions of the Jablonka catchment with accent to relief and to evaluate its anthropic transformation. For the purpose of better understanding of the landscape transformations as well as transformations of runoff geomorphic processes by man's influence, we also deal with a settlement evolution and with a history of collectivization in farming. Presented results were reached at the 1st stage of solving the above mentioned project.

The methodological apparatus consists of an analysis of historical data (including old maps), comparison of aerial photographs of two time horizons, detailed mapping of the geomorphic consequences of particular meteorological events (heavy rainfalls and snowmelt) as well as measurements of thickness of bottom fillings in dells or dell-like valleys, accumulated here since the beginning of collectivization, using in situ scales.

CONTEMPORARY STATE OF THE GEOMORPHIC RESEARCH OF THE JABLONKA CATCHMENT WITH A SPECIAL ATTENTION TO THE OPERATION OF THE GEOMORPHIC PROCESSES

The investigation of the geomorphic conditions of the study area with a special regard to the land form shaping by the present-day geomorphic processes, especially by the runoff geomorphic ones, started in the 1970s. Stankoviansky (1977) elaborated the geomorphic map as well as the map of the spatial distribution of potential runoff geomorphic processes in the Hrabutnica (Jablonka) Catchment and adjacent territories in the scale of 1:50 000. The mentioned author later outlined the operation of the present-day exogenic geomorphic processes in the Myjava Hills and adjacent part of the White Carpathians (1981, 1985), characterized the relief of the Myjava Hills with special attention to its shaping in the Holocene (1994c) as well as the importance of land use changes concerning collectivization for the course of runoff geomorphic processes (1994b), outlined the long-term evolution of geomorphic processes in this territory as a response to the land use changes (1995b) and elucidated the geomorphic effect of the surface runoff (1996b).

As to the Jablonka Catchment itself, Stankoviansky (1996a) outlined soil erosion evolution in this area under the influence of land use changes, Lehotský (1995) characterized its pedological conditions in relation to the runoff geomorphic processes, Solín, Lehotský (1996) assessed the susceptibility of this territory to the soil erosion and Urbánek (1995) paid attention to the methodological problems of the solving the above mentioned project in this region.

Some works were devoted to the special topics in the selected portions of the Jablonka Catchment, namely to the rill erosion provoked by melt waters in its upper part (Stankoviansky 1995a), to the evaluation of land use changes between the years 1955 and 1990 on the example of the eastern part of the Jablonka Catchment (Hanušín, Solín, Urbánek 1995) and to the modelling of water soil erosion in its partial catchment near Kostolné (Hofierka, Šúri 1996).

NATURAL CONDITIONS OF THE STUDY AREA

The Jablonka catchment is situated in the western Slovakia at the boundary with Czech Republic and the contact zone of the Inner and Outer West Carpathians (Fig.1). It is a part of three geomorphic units namely of the White Carpathians, the Myjava Hills and the Little Carpathians. The Myjava Hills represent a lowering between more uplifted White Carpathians and less uplifted Little Carpathians (Stan-koviánsky 1994a).

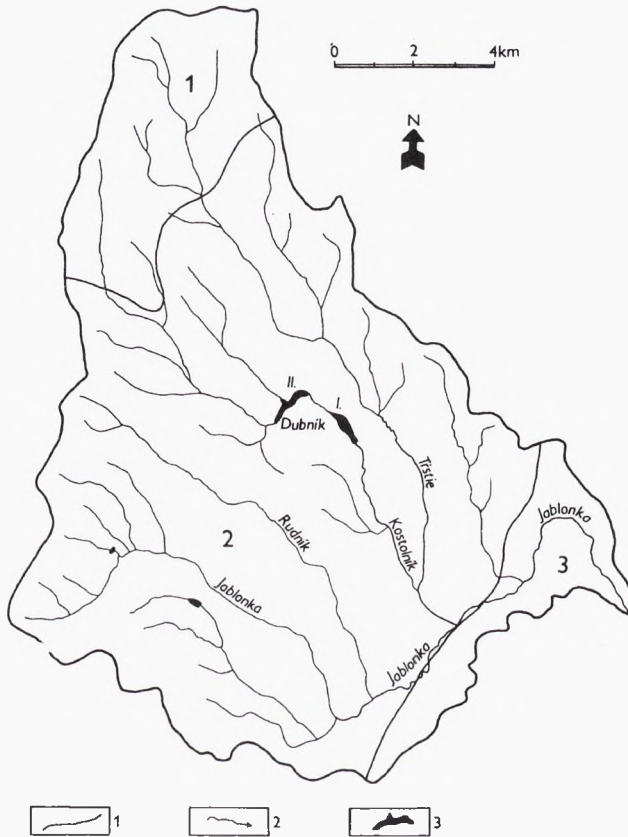


Fig. 1. Location map of the Jablonka catchment with geomorphic units (1. White Carpathians, 2. Myjava Hills, 3. Little Carpathians).
1. Geomorphic unit boundaries, 2. Streams, 3. Water reservoirs

The Jablonka catchment has 163 km^2 of total area. Maximum altitude point (950 m) is in watershed in the White Carpathians in the massif of the Velká Javorina, minimum altitude (180 m) is in the outlet of the Jablonka River from the Little Carpathians at Čachtice.

The White Carpathians are built of the Palaeogene flysch rocks of so called outer flysch, the Little Carpathians are built of the Mesozoic limestone - dolomite comple-

xes. The most complicated geological conditions are typical for the Myjava Hills. They are built of heterogeneous complexes of the Klippen belt, Senonian marlaceous and flysch-like complexes, Palaeogene flysch complexes of outer and also of central-carpathian flysch as well as Neogene conglomerates and sandstones (cf. Salaj et al. 1987). Predominant part of rock complexes, above all in the Myjava Hills and in adjacent part of the White Carpathians, shows medium to low resistance, resulting in considerable thickness of regolith. This fact is in some places multiplied also by presence of loess loams. The predominant part of the Jablonka Cathment, from the viewpoint of geological conditions, shows therefore a considerable liability to the runoff geomorphic processes.

Eight relief types can be delimited in the Jablonka catchment (Stankoviansky 1977). From massive, central ridge of the White Carpathians to the lowest parts of the Myjava Hills at the contact with the Little Carpathians predominantly smoothly modelled, denudational relief occurs. Four relief types can be differed in this direction though without distinct boundaries among them. Their delimitation is associated above all with different relief energy or in other words with different vertical dissection, which lowers accordingly with diminishing absolute altitude. These are as follows: deeply dissected relief of highlands (more than 310 m rel.), medially dissected relief of uplands (180-310 m rel.), strongly undulated to moderately cut relief of subuplands (100-180 m rel.) and moderately to medium undulated relief of hills (30-100 m rel.). Beside lowering of relief energy value also widening of valleys, lowering or shallowing of their slopes and flattening of ridge summits occur in the same direction. This scheme is disturbed only in case of the shallow threshold situated between two islands of hilly relief as well as in case of some segments of the Klippen Belt built of more resistant limestones, showing a more sharply shaped relief of monadnocks. The Little Carpathians, or better said their northern part belonging to the area under study, represents from the point of view of relief energy a dissected upland, but this upland relief markedly differs from the upland relief in the White Carpathians. Differences are influenced by active as well as passive geological structure. The Little Carpathians represent sharply bordered horst built of rock complexes (Mesozoic limestones and dolomites) with more distinct manifestations of passive structure and lithology. Valleys in the Little Carpathians are flowless with the exception of canyon-like valley of the Jablonka River crossing the mountains. It is possible to differ a more massive northern part and a narrower southern part of the horst. Relief type of karst plateau is situated to the N of Čachtice.

One of specific features of the geomorphic conditions of the hilly part of the study area, belonging to the Myjava Hills, is above all its plateau-like character. The original widespread plateaus were cut by the local rivers and streams, whereas the typical depth of incision ranges from 40 to 80 m, only exceptionally more than 100 m. Thus, the present-day relief is characteristic by alternation of not very high, broad and flat ridges with a relatively thick eluvia and broad valleys with well developed flood plains or dell-like valleys, respectively. Their convex-concave slopes are covered by relatively thick deluvia. Only segments of some valleys, incised into more resistant rock complexes show different character. They taper and have trough-like shape with steep, rectilinear slopes covered by much shallower deluvia.

Another specific feature of the Myjava Hills relief is the presence of a number of single or complex dells, deepened in the ridge or valley sides, representing thus slope basins, practically flowless under normal conditions but changing into the most dynamic land portions during heavy rainfalls and snowmelt. A dense network of these dell basins, concentrating the surface runoff in time of mentioned events, makes from the

Myjava Hills a geomorphic unit with a very high liability to the action of the runoff geomorphic processes.

Spatial distribution of soils in the Jablonka catchment is conditioned above all by chemical composition of underlying rocks and character of relief. Eutric and Dystric Cambisols originated on flysch-like and conglomeratic parent rocks in areas with highland, upland and subupland relief types. Dystric Planosols are typical for more clayey regolith. Luvisols are characteristic for flysch-like and marlaceous rocks in area with hilly relief type. Locally, above all on loess loams, Gleic Luvisols originated. For islands of carbonatic rocks in the Klippen Belt Rendzinas and Calcaric Regosols are typical. Rendzinas are generally distributed above all in the Little Carpathians. Flood plains in the whole area are covered by Eutric and Stagno-gleyic Fluvisols (cf. Tarábek 1985). Mentioned soil types are predominantly of loamy, locally of clayey-loamy character and thus very liable to erosional action of runoff.

From the climatic point of view, the Myjava Hills as geomorphic unit comprising predominant part of the Jablonka catchment, represent the type of warm piedmont hillyland. The Little Carpathians shows the type of moderately warm upland, the highest parts of White Carpathians the type of cool highland. Climatic conditions of the Jablonka catchment with differing its lower and higher parts are characterized in Tab. 1.

Tab. 1. Selected climatic parameters of the Jablonka catchment (by Tarábek 1985)

Parameters	Part of the Jablonka catchment in:	Myjava Hills	White Carpathians
mean air temperature in July		18° - 19°	14° - 18°
mean air temperature in January		-3° to - 3.5°	-4° to -5°
number of summer days (with max. air temperature of 25° and higher)		35 - 50	25 - 30
mean annual precipitation (in mm)		650 - 700	800
number of days with precipitation of 1 mm and more		93 - 110	110 - 130
number of days with possible occurrence of snow cover		110 - 115	120 - 130
number of days with permanent snow cover		52 - 60	70

From the viewpoint of high-rate runoff generation, provoking the intense water-induced geomorphic processes, the most important and the most damaging factor is represented by heavy spring rainfalls, which are relatively frequent here.

The Jablonka catchment has a fan-shaped river network (see Fig.1). Three streams of similar length concentrate at Hrachovište. Two of them spring in the White Carpathians, namely Trstie (17 km to confluence) and Kostolník (15 km to confluence).

ce with Trstie), the third Jablonka (14 km to confluence with Trstie), together with its main tributary Rudník springs in the Myjava Hillyland. Though Jablonka is only the third longest flow, the joint flow created by their confluence, crossing the Little Carpathians in length of 7 km, bears the name Jablonka. Average annual discharge of the Jablonka at Čachtice is $1.09 \text{ m}^3/\text{sec}$. Average annual runoff of its catchment is 211 mm. There are four water reservoirs in the study area, out of which Dubník I is the largest and oldest one. It was built in years 1953-64, its area represents 0.178 km^2 and the volume of water is 0.657 mil. km^3 .

Study part of the Myjava Hills was originally covered above all by oak and oak-hornbeam forests, the highest parts (Krajníanska hora) by beech forests. Flood plains were characteristic by alluvial forests. Lower parts of the White Carpathians were covered by oak-hornbeam forests, higher parts by beach forests with admixture of coniferous ones. For the Little Carpathians oak, oak-hornbeam, xerophilous oak forests and stone steppes were typical (cf. Krippel 1985).

OUTLINE OF THE SETTLEMENT EVOLUTION

Present landscape of the Jablonka catchment is a result of almost seven centuries lasting activity of man in former natural landscape of the area under study. The oldest commune in the territory is Čachtice, the first written reference to it comes from 1248. In that time the unsettled part of the study area in the Myjava Hills was situated in so called *confinium*, relatively depopulated, some ten kilometers wide boundary zone at the contact of the Hungarian and Czech states. Important landmark from the point of view of settlement of the Jablonka catchment was the construction of the Čachtice Castle in the Little Carpathians in the second half of the 13th century. In connection with securing the economic basis for the needs of the castle, the Čachtice domain initiated in 14th century the foundation of 10 villages in the area under study in till that time undisturbed, virgin nature (cf. Varsík 1972). Gradual settlement from E, accompanied by forest cleaning and establishing of pastures, meadows and fields resulted in creation of the first islands of agricultural landscape around the founded villages.

Beginning of the main wave of the settling of the area under study is connected with the 2nd half of the 16th century, when numerous fugitives escaping from Turks' raids began to come from S. This invasion, accompanied also by moving of people from the surroundings, as well as people of Wallachian origin resulted in a relative overpopulation of the villages what became a base for so called "kopanitse" colonization. The ground in the surroundings of villages did not suffice to nourish its inhabitants and landlords did not allot a more easily cultivatable ground to peasants (villagers) any more, as they occupied it for their large farms (*praedia*). Peasants therefore had to gain the ground of till that time untouched, forested landscape in more distant areas. There they built their dwellings and founded their little farms. This way originated the so called "kopanitse" - hamlets, small settlements, separated from mother communes. Intensity of "kopanitse" settlement reached its summit at the end of the 18th century (cf. Lauko 1985). Characteristic land use pattern of the "kopanitse" region, as we know it at the end of the 1st half of the 20th century, is a dense network of hamlets, dispersed between villages or small towns.

Spatial distribution of the "kopanitse" settlement is illustrated on Fig. 2. This sketch shows, that "kopanitse" settlers have settled land portions more distant from the Čachtice Castle (the centre of the Čachtice Domain) and that no hamlets were founded in cadasters of villages situated in close neighbourhood of the Castle.

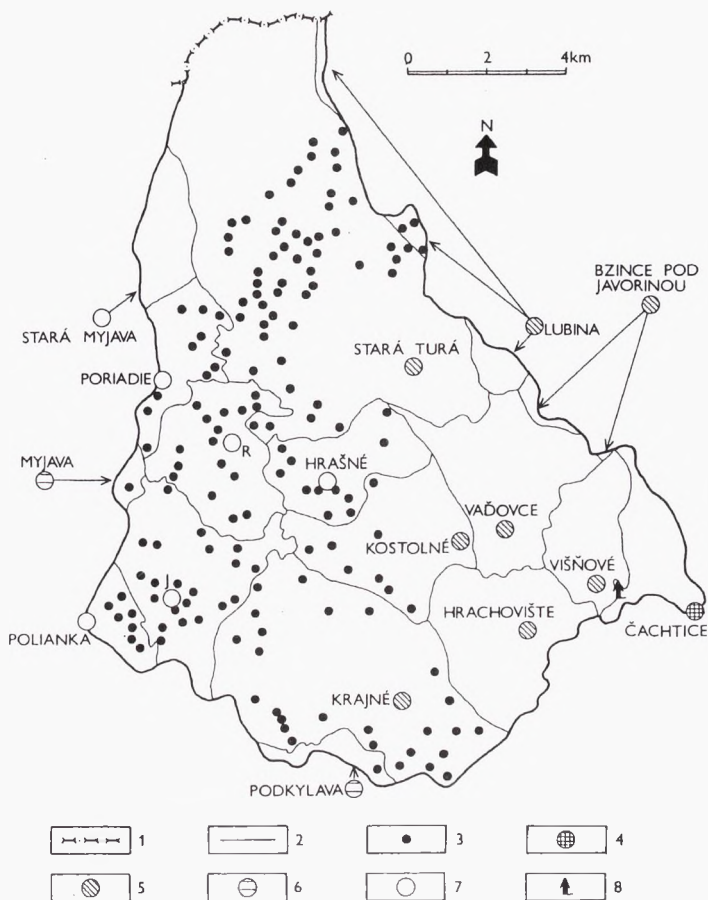


Fig. 2. Map of settlements in the Jablonka catchment.

1. State boundary with Czech Republic, 2. Cadaster boundaries, 3. Hamlets ("kopanitse"), 4. Communities known in the 13th century, 5. Communities founded in the 14th century, 6. Communities founded in the 16th century and later in the framework of the so called "kopanitse" colonization, 7. New communities originated by administrative separation from already existing ones in the 20th century, 8. The Čachtice Castle.
J - Jablonka, R - Rudník.

HISTORY OF COLLECTIVIZATION IN FARMING

The last marked human intervention in the landscape of the study area is represented by collectivization in farming after the political and social changes in 1948. In the course of collectivization the principal, large scale changes of utilization of agricultural areas in the frame of the original "kopanitse" landscape were realized. Collective farms originated in individual communes of the study area in the years 1949-1960 (see Fig. 3). In the first years only so called minority collective farms were founded which utilized practically only the communal and church ground. Intensification of collectivization process began in 1957, while so called majority collective farms were established until 1961. The last stage of collectivization was realized in 1972-75, when it was definitively finished. In this period the last collecti-

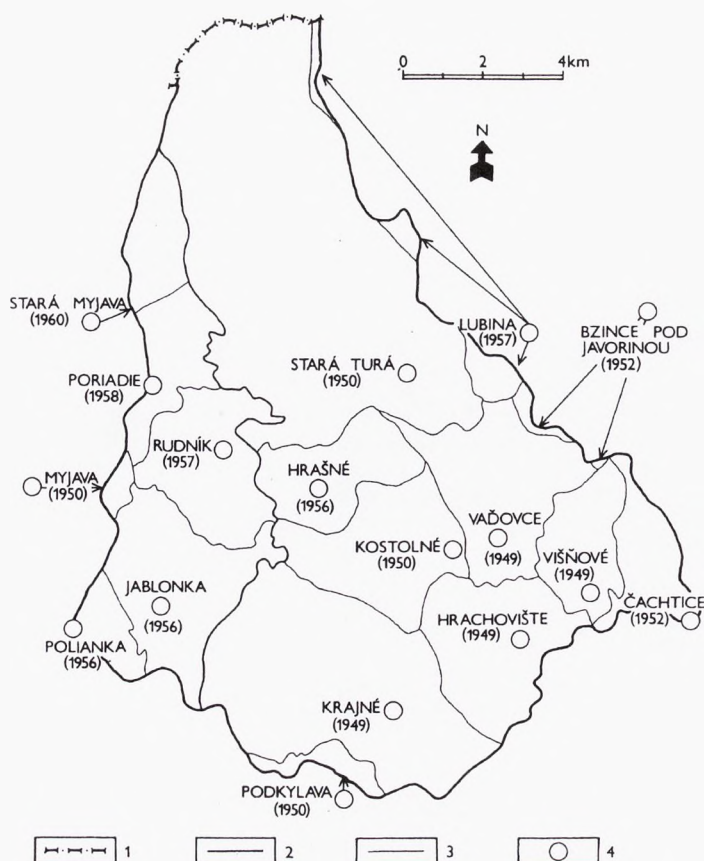


Fig. 3. Map of collective farm foundation in the Jablonka catchment.

1. State boundary with Czech Republic, 2. District boundary, 3. Cadaster boundaries, 4. Communities.

Note: Years in brackets mean years of collective farm foundation in the framework of individual communities.

ve farm in the study area (Matejovec) was founded in till that time uncollectivized part of the Krajné cadaster. Terrain adjustments connected with the merging of original small plots into large cooperative fields were performed in some phases, corresponding usually to collectivization stages, different in individual communes.

Differences among collectivization stages can be very well demonstrated on examples of villages Kostolné and Krajnέ in the framework of which a detailed archival search was realized.

Collective farm in Kostolné was founded in 1950. In 1951, the first two cooperative fields originated on the basis of merging the communal and church ground, in 1952 eight another fields originated. In 1957, a transformation of formerly minority farm to the majority one arose what resulted in main stage of cooperative fields origin within the next 2-3 years. In 1960 practically all agricultural ground of the Kostolné cadaster was collectivized. The age span of the cooperative field origin in Kostolné is then 9 years.

The collective farm in Krajné was founded in 1949. In the same year, the merging of the communal and church ground arose. The first five cooperative fields originated. The next stage was realized after the majority farm establishment in the same years as in Kostolné. In this period, partial farm in hamlet of Babulicov Vrch originated. The main stage of plot merging was realized in 1972-75. In that time, further cooperative fields originated in the farms in Krajné and Babulicov Vrch and above all in already mentioned farm in hamlet of Matejovec, founded in 1972. The age span of the cooperative field origin in Krajné is then 27 years. Comparing both spans we see that age difference between the origin of the first and the last cooperative fields in investigated villages is considerable.

For the purpose of simple preliminary differentiation of the total geomorphic effect upon individual cooperative fields within cadasters of investigated villages we have accepted the following presumption: the older the cooperative field, the stronger the long-term affection by runoff geomorphic processes upon it or in other words, the greater total geomorphic effect (of course under similar character of topography and crop rotation). On the basis of this consideration, generally speaking, cooperative fields in Kostolné perhaps show bigger total geomorphic effect than the fields in Krajné.

ANTHROPIC TRANSFORMATION OF LANDSCAPE AND OF RUNOFF GEOMORPHIC PROCESSES

Still in the 13th century, forests were covering whole area under study (cf. Varsík 1972). Present-day forests (Fig.4) represent here only the torsos of the original forests (cf. Ložek 1992). We suppose, that the lowest extension of forested areas corresponds with the end of the 18th century, when "kopanitse" colonization culminated (see above). In the 19th century plantation of numerous islands of secondary coniferous forests in the part of study area belonging to the Myjava Hills was realized (cf. Krippel 1985). The forested areas were slightly enlarged in the period since collectivization till the present time and the small forest spots in cooperative fields, as well as the tree belts along the agricultural terrace edges or water flows were also liquidated. The forestation of such land portions where the use of mechanization was not possible, was not a rare phenomenon at this period. This statement is supported also by Hanušin et al. (1995) who compared the land use pattern in the years 1955 and 1990 at the eastern part of the Jablonka catchment (56 km²) on the basis of the analysis of aerial photographs. One of the most remarkable changes in the mentioned years was the extension of the forested areas of 20 % in 1955 to almost 30 % in 1990.

As to hydrological transformations we can differ two main groups of man's interventions into the hydrological element of the landscape - the direct and indirect ones. Under the direct interventions we understand the creation of paired streams in the framework of the mill-race construction, typical for the period of "kopanitse" colonization, changes of stream courses as a result of river channel adjustments, as well as the construction of water reservoirs, typical above all for the last 40 years. The indirect influence of man is reflected by the changes of runoff regime resulting in flash floods (cf. more details in Stankoviansky 1996b). This phenomenon is a consequence of the destruction of former plot pattern and creation of large cooperative fields during collectivization.

Geomorphic anthropic transformations can be understood as transformations of geomorphic processes or of the relief itself. Land use changes due to the "kopanitse"

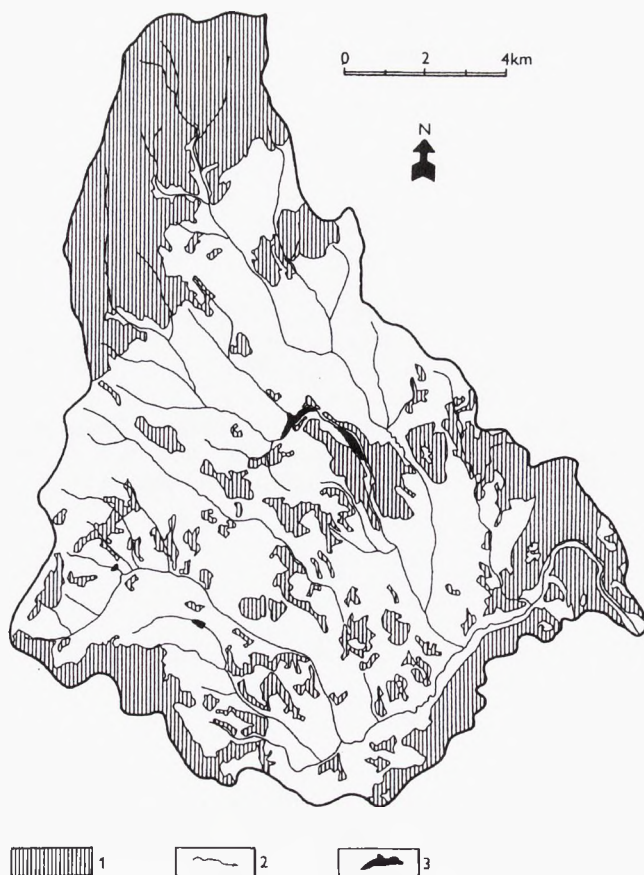


Fig. 4. Map of forests in the Jablonka catchment.
1. Forests, 2. Streams, 3. Water reservoirs

colonization resulted above all in creation of dense network of gullies or ravines as well as of thick colluvia upon foot slopes or colluvial fans in mouths of the dells, dell-like valleys or gullies. Large scale land use changes due to the collectivization (see above) resulted in a modification of runoff geomorphic processes. It predominantly concerns the enlargement of the areas with regular occurrence of the above cited processes and their intensifying. The present-day landscape of the area under study, represented by cooperative fields is strongly affected by the runoff geomorphic processes. We can formulate the following general statements on the basis of investigation of these processes:

- the runoff geomorphic processes show temporal and spatial variability, based on selectiveness of their action in relation to land use and type of cultivation (they occur almost exclusively on active fields),
- the most affected localities are represented by basins of dells or dell-like valleys, where beside common phenomena of areal runoff erosion also concentrated flow

erosion (cf. more detail in Stankoviansky 1996b) occurs, while topographically raised effect of processes can be still elevated in case of the introduction of unsuitable crop,

- the raising affection of the territory by runoff geomorphic processes, as a consequence of collectivization, took place differentially. It was manifested much more on those cooperative fields which originated by merging and levelling the formerly terraced contour plots. Dynamics of runoff processes on cooperative fields originated by merging the formerly gradient plots did not show such marked raising as these localities were affected by intense soil removal even before collectivization.

The relief transformations, similarly to the hydrological ones, can be differred as direct and indirect results of anthropic activity. The first group is represented by

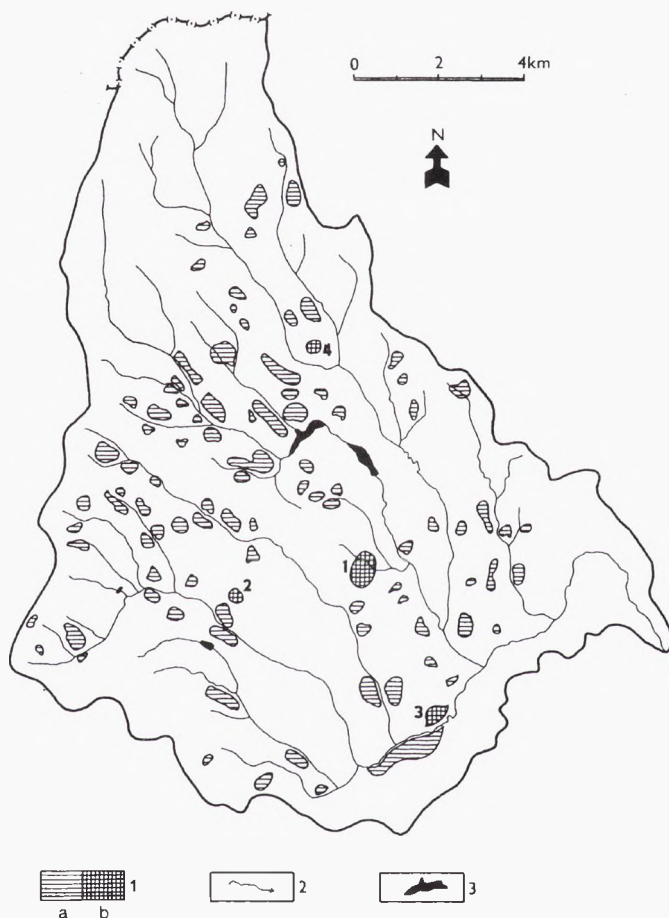


Fig. 5. Map of localities with regular or frequent occurrence of runoff geomorphic processes.

1.a. Affected localities, 1.b. Model localities selected for investigation of total geomorphic effect of runoff within evaluated period (1 - Malinište at Kostolné, 2 - Luskovica at Krajné, 3 - Babikovec at Hrachovište, 4 - Lazový Jarok at Stará Turá), 2. Streams, 3. Water reservoirs

anthropic land forms created directly by man. The second group, much more important from the point of view of our investigations, represents changes of relief geometry resulting from slope lowering and from accumulation of eroded material on foot slopes or in valley or dell bottoms as a consequence of anthropically conditioned intensifying of processes. The maximum thickness of the material accumulated in the dell bottom since the collectivization, found out up to the present time, reaches ca 1 m at the locality Luskovica (cf. Stankoviansky 1995b).

The most important relief transformations concern the localities with the strongest affection by runoff geomorphic processes. These are above all the deepened land forms as dells or dell-like valleys. Mentioned land forms concentrate superficially flowing water during heavy rains and snowmelt resulting in a marked intensification of the runoff erosion-accumulation processes. Survey of the localities with regular or frequent occurrence of the runoff processes and thus localities with the supposed strongest affection by these processes is shown in Fig. 5. This map was elaborated on the basis of personal communications with local agricultural engineers. Four of delimited localities were selected for more detailed investigation of the total geomorphic effect since the beginning of collectivization till the present time.

CONCLUSION

The natural conditions and land use changes have made the study area particularly liable to the runoff geomorphic processes. Both "kopanitse" colonization and collectivization in farming resulted in characteristic spatial distribution, course, intensity and geomorphic effect of these processes. While for "kopanitse" landscape above all the linear (gully) erosion was typical, collectivized landscape is predominantly characterized by the areal erosion.

Present-day research in the framework of the above mentioned project is oriented towards the assessment of the differences between former and present landscape from the viewpoint of the catchment response to the land use existing in both temporal horizons. At the last phase the more detailed investigation was oriented towards the selected catchment portions (as you can see on Fig. 5), using beside others the CS¹³⁷ and the dendrogeomorphic methods.

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PRÍRODNÉ POMERY POVODIA JABLONKY A JEHO ANTROPOGÉNNÁ TRANSFORMÁCIA

Cieľom príspevku je charakterizovať prírodné pomery povodia Jablonky (163 km²), ktoré je situované vo východnej časti Myjavskej pahorkatiny a priľahlých častiach Bielych a Malých Karpát. Dôraz sa kladie na jeho predisponovanosť voči ronovým geomorfologickým procesom a zároveň sa hodnotí historický vývoj jeho antropogénnych transformácií. Autor rozoberá jednotlivé etapy osídľovania územia s dôrazom na kopaničiarsku kolonizáciu a charakterizuje priebeh kolektivizácie v poľnohospodárstve, oboje vo vzťahu k vývoju uvedených procesov.

Pri hodnotení antropogénnych transformácií krajiny sa venuje pozornosť vývoju využívania zeme, transformáciám riečnej siete a zmene odtokových pomerov, priamym i nepriamym zásahom človeka do reliéfu, modifikácii priebehu ronových geomorfologických procesov a ich geomorfologickému efektu.

Prírodné pomery, ale predovšetkým zmeny využívania zeme v študovanom území, podmienili jeho významnú predisponovanosť voči pôsobeniu ronových geomorfologických procesov. Kopaničiarska kolonizácia, ako aj kolektivizácia v poľnohospodárstve mali za následok špecifický vývoj priestorového rozloženia, priebehu, intenzity a geomorfologického efektu týchto procesov. Kým pre pôvodnú kopaničiarsku krajinu bola typická vedúca úloha lineárnej (výmolovej) erózie, pre kolektivizovanú kopaničiarsku krajinu je charakteristická predovšetkým erózia areálna.

Tab. 1. Vybrané klimatické parametre povodia Jablonky (podľa Tarábka 1985).

Obr. 1. Lokačná mapka povodia Jablonky s geomorfologickými jednotkami.

(1. Biele Karpaty, 2. Myjavská pahorkatina, 3. Malé Karpaty)

1. hranice geomorfologických jednotiek, 2. toky, 3. vodné nádrže

Obr. 2. Mapka osídlenia povodia Jablonky.

1. štátna hranica s Českou republikou, 2. katastrálne hranice, 3. kopanice, 4. obce známe v 13. storočí, 5. obce založené v 14. storočí, 6. obce založené v 16. storočí a neskôr v rámci tzv. kopaničiarskej kolonizácie, 7. nové obce vzniknuté administratívnym oddelením z už existujúcich obcí v 20. storočí, 8. Čachtický hrad. J - Jablonka, R - Rudník.

Obr. 3. Mapka zakladania JRD v povodí Jablonky.

1. štátna hranica s Českou republikou, 2. okresná hranica, 3. katastrálne hranice, 4. obce.

Poznámka: roky v zátvorkách znamenajú roky založenia družstiev v jednotlivých obciach.

Obr. 4. Mapka lesov povodia Jablonky.

1. lesy, 2. toky, 3. vodné nádrže.

Obr. 5. Mapka lokalít s pravidelným alebo častým výskytom ronových geomorfologických procesov.

1a. postihnuté lokality, 1b. modelové postihnuté lokality, vybrané pre výskum totálneho geomorfologického efektu ronů za hodnotené obdobie (1 - Maliníšte pri Kostolnom, 2 - Luskovica pri Krajnom, 3 - Babikovec pri Hrachovišti, 4 - Lazový jarok pri Starej Turej), 2. toky, 3. vodné nádrže.