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On distribution of slope deformations in the north-eastern part of the Vizovická vrchovina Highland in Eastern Moravia

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Abstract

The slope deformations were surveyed and documented through engineering-geologic mapping and detailed geomorphological mapping in the north-eastern part of the Vizovická vrchovina Highland. Altogether, 93 localities of slope deformations were identified, which include displays of creep, sliding and rock fall. New findings on the relation of slope deformations to environmental controls arose apart from the identification of slope deformations types. Further output is a new insight into the geomorphology of the area. Special attention was paid to the deep-seated slope deformations which play the important role in the development of central mountainous slopes of Vizovická vrchovina Highland.

Key words: slope deformations, detailed geomorphological mapping, Vizovická vrchovina Highland

1. Introduction

Outer Western Carpathians in eastern Moravia form largely dissected relief of highlands and mountain ranges with intervening deep valleys and basins. The area is built by the complexes of flysch rocks. Slope movements are characteristic landscape forming agent, with predominance of sliding, which result in many types of slope deformations. The importance of the slope movements in the development of the relief in the Outer Western Carpathians have not been much appreciated by geomorphologists. Extensive activation of slope movements following the extreme precipitation in July 1997 clearly showed their high geomorphic potential as well as destruction power within the landscape. The situation triggered the detailed geological and geomorphological investigations of slope deformations in the most affected areas; the study was also pointed to the recent vast dormant landslides (Kirchner, Krejčí 2002). The investigation was performed within the project of geological works of the Ministry of Environment of the Czech Republic "Slope Deformations in the Czech Republic". The investigations brought a lot of knowledge which enable better understanding and appreciation of the role of slope movements in the development of the flysch landscape of eastern Moravia. The research is presently supported and its outcomes are utilised in the grant project GA ČR 205/03/0211. Landslides are classified as a part of natural geomorphic extremes, which are comprehended in accordance with the concept of geomorphic hazards, risks (e.g. Panizza 1987; Kalvoda 1996). We have mapped slope deformations in the Zlín region in the north-eastern part of the Vizovická vrchovina Highland within the project "Slope deformations in the Czech Republic" during years 2002–2003 (Kirchner et al. 2002, 2003a). There are only a few results of geomorphological investigations available from this area; slope deformations were studied mainly in the eastern part of the Vizovická vrchovina Highland in the surroundings of Lidečko (Baroň et al. 2002). The information was gained not only about the types of slope deformations, but also about the link between slope deformations and their controlling variables. Some information about the research have been already published (Kirchner et al. 2004), that is why only new findings which resulted from the field survey during year 2004 are presented and geomorphic aspects of slope deformations and relief development are accentuated.

2. Methods

The engineering-geological approach was adopted for the mapping of slope deformations (for more details see works of Rybář 1999; Rybář et al. 1999; Kirchner 2002); mapping was conducted in the scale 1:10 000). Types of slope movements are distinguished according to Nemčok et al. (1974); surface creep, sliding, flowing and rock falling were found in the study area. Resultant slope deformations are classified according to their age as either old or recent. The areas with inexpressive forms of slope movements are designated as old deformations. Gravitational disruption of slopes took place in the past. Recent slope deformations are classified into three categories: active, dormant (potential) and stabilised. Downward movement, distinct fresh forms of scarps and accumulations as well as open fissures are characteristic for active slope deformations. All slope deformations were indicated on the map as much precisely as possible by its outline (deformations with dimension above 50 m) or by symbol (smaller ones). Recorded were also springs, seepage areas, gullies, quarries and sand pits in accordance with the legend of engineering-geological maps. Selected methods of detailed geomorphological mapping were also used during the survey of slope deformations (Demek ed. 1972); we recorded expressive landforms, mainly structural, fluvial, man-made forms and landforms important from the nature conservation viewpoint. We used altimeter WindWatch for determination of altitude, electronic tape Bushnell Yardage Pro for measurement of dimensions of slope deformations, Clino Master for measurements of slope inclination and geological compass for surveying of rock structures during the fieldwork.

The information about the distribution and types of slope deformation and about the basic relief features of the area was gathered by methods of engineering-geological mapping and detailed geomorphological mapping. Gained information enabled to analyze slope deformations in the context of landscape of the study area and seek the relationships between distribution of slope deformations and character of abiotic environment. The main attention was concentrated upon the geomorphic aspects of the distribution and origin of slope deformations. The further outcome is more specific information about the character of the relief in the study area (e.g. geometry of channel network, distribution of cryogenic and anthropic landforms), with relation to relief genesis.

Survey of slope deformations was conducted in the area covered by map sheets 1 : 10 000: 25-32-25 and 25-32-24, which cover central part of Vizovická vrchovina Highland east of Vizovice (Fig. 1). The works ran in the course of years 2002–2003 with some supplementary research during the summer 2004. We have analysed altogether 93 slope deformations and described the relations between their distribution and the character of abiotic environment. The following text contains the gained information.

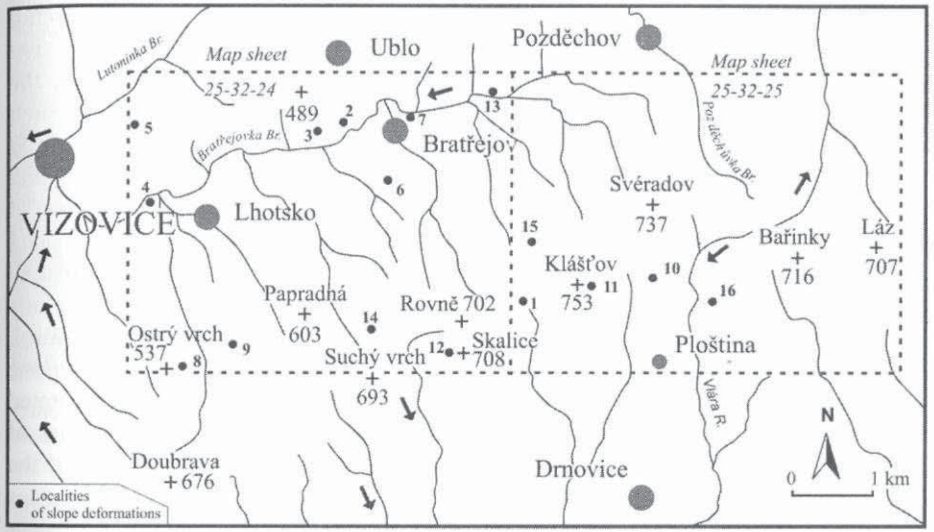

Fig. 1 Schematic map of study area with selected localities of slope deformations
Sliding: **1** – the Vysoké Pole-Skalice IV potential landslide, **2** – the Ublo-Stráně I potential landslide, **3** – the Ublo-Brtě I potential landslide, **4** – the Vizovice active landslide, **5** – the Vizovice-Na Manském active landslide, **6** – the Cooperative farm active landslide, **7** – the Football playground active landslide; *Surface creep:* **8** – Ostrý vrch Hill, **9** – the Papradná Hill, **10** – the Elevation 661 m-north of Ploština settlement; *Rock falls:* **11** – the Klášťov rock, **12** – the Skalice rock, **13** – the Bratřejovka Brook active rock falls; *the Ancient slope deformations:* **14** – the Bratřejov-Rozepře landslide, **15** – the Mezné landslide, **16** – the Peklo (Hell) landslide

3. Geomorphological setting of the study area

The study area lies approximately 6 km southeast of Vizovice (Fig. 1); it lies in the north-eastern part of the geomorphological unit the Vizovická vrchovina Highland in the Slovakian-Moravian Carpathians (Czudek ed. 1972; Demek ed. et al. 1987). The area is built by flysch Paleogene rocks of Zlín Formation and Soláň Formation of the Rača tectonic unit of the Magura Flysch Belt. The study area is dominated by the central summit ridge of the geomorphological sub-unit – Komonecká hornatina Mountains (geomorphological district Klášťovský hřbet Ridge). The Klášťovský hřbet Ridge merges in the north with the lower relief of the geomorphological sub-unit – Zlínská vrchovina Highland, which manifests itself by expressive elongated depression of Vizovická kotlina Basin (geomorphological district). It is bordered by higher relief of geomorphological district – Senická vrchovina Highland in the north. Bratřejovka and Lutonínka brooks (Dřevnice drainage basin) and Pozděchůvka (Senice drainage basin) drain northern and north-western slopes of the Komonecká hornatina Mountains and part of the Zlínská vrchovina Highlands. Vlára river with its tributaries (Váh drainage basin) drains southern and south-eastern slopes of Komonecká hornatina Mountains. What concerns the position within the climatic regions (Quitt 1971), the summit area of the Komonecká hornatina Mountains belongs to the cold region – CH 7 (annual precipitation 850–1000 mm), lower relief of the Vizovická vrchovina Highland belongs to temperate region – MT 7 (annual precipitation 650–750 mm), remaining part of the study area belongs to the temperate region – MT 2 (annual precipitation 700–800 mm). The higher values of annual precipitation are characteristic for the study area and influenced the activity of sliding. More than 60% of the area is covered by forest, settlement (villages Bratřejov, Ublo and Lhotsko) and agricultural land (predominantly pastures) lie in the lower relief of the Vizovická kotlina Basin. Typical dispersed Valachian type of settlement is present at the foothills of the central range of the Komonecká hornatina Mountains.

The Klášťovský hřbet Ridge forms the central part of the Komonecká hormatina Mountains (Photo 2); it reaches the altitude around 700 m asl at the summits of hills Klášťov (753 m), Svéradov (737 m), Bařinky (716 m), Skalice (708 m), Láz (706 m), Suchý vrch (693 m). The subordinate ridges run out of the main ridge in the north-western and south-eastern directions (e.g. Papradná 603 m), which are separated by deeply incised valleys. Bedrock consists mainly of coarse-grained sandstones of Luhačovice Member of Zlín Formation, in a lesser extent by silty sandstone of the Újezd Member of the Zlín Formation and coarse-grained to medium-grained sandstones of the Lukov Member of the Soláň Formation (Jinochová et al. 1999). Claystones occur only marginally. Within the tectonic setting, rocks are part of the Čertovy kameny – anticlinal zone – with anticlinal position of flysch strata. Resistance of rocks and position of strata conditions the structural-denudational relief of the Klášťovský hřbet Ridge with steep slopes, isolated boulder accumulations and sandstone outcrops (rock forms – Klášťov, Skalice, Sloupová, Hůrka).

Spring depressions are typical for the study area; they form sources of the deeply incised upper reaches of water courses with displays of active channel erosion. Foothills of structural slopes form an abrupt knickpoint where thick colluvial deposits are deposited, there also occur numerous springs. Boulder accumulation up to 1 m high was discovered at Ostrý vrch Hill (537 m) in the western part of the study area; accumulation surrounds the eastern flank of the summit flat of the hill. It is most probably the remnant of the fortification of the primeval settlement site.

The study area is built by the Vsetín Member of the Zlín Formation north of the Klášťovský hřbet Ridge; strata consist mainly of calcareous claystones laying upon fine-grained glauconitic sandstones. There, expressive depression came into existence – Vizovická kotlina Basin (Photo 2), which has probably the structural predisposition. It is elongated in the NE–SW direction from Vizovice towards Bratřejov, altitudes reaches 330–400 m asl. The foothill pediment spreads from the Klášťovský hřbet Ridge towards the valley of the Bratřejovka Brook and is only slightly inclined. Some monadnocks protrude from the higher parts of the Vizovická kotlina Basin in its south-eastern part; they are genetically linked with the stripe of sandstone stretched in the SW–NE

Photo 1 Northern part of study area near Bratřejov. Flat relief of the Vizovická kotlina Basin with planation surface – type of pediment – traverses in the steep slope of the Seninecká vrchovina Highland, which is modelled by sliding (Photo K. Kirchner)

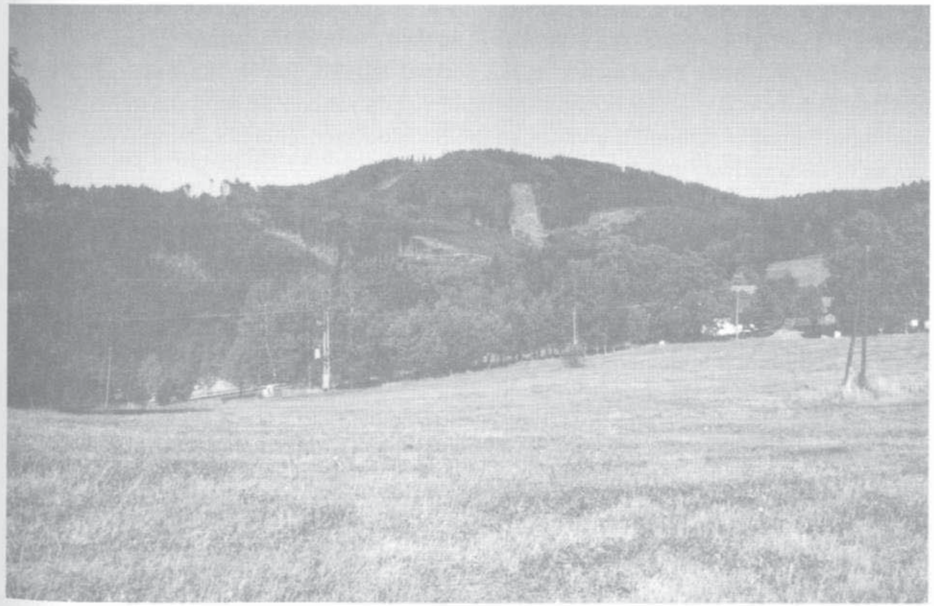

Photo 2 The Klášťov Hill (753 m) in central part of Komonecká hornatina Mts. north of Plošina settlement. Typical structural-denudational relief is built by sandstones of the Luhačovice Member of the Zlín Formation. There are many rock forms and boulder accumulations in upper part of Komonecká hornatina Mts. (Photo K. Kirchner)

direction. The pediment merges in its north-western part with broad valley floors of the Bratřejovka Brook. However, erosional planation surface passes into accumulation surface in the lower lying, north-western part of the basin. There are proved thick deluvial deposits (up to 15 m) with admixture of rounded fluvial sandstone pebbles in the upper layers (probably the remnants of alluvial fan). The Bratřejovka Brook is incised into these deposits, which forms Holocene alluvial plain up to 200 m wide. We presume that flat surface originated as a classic pediment, but cryopedimentation can not be excluded as a forming process. That part of the erosional surface which is covered by sediment may be designated as a peripediment. East of Bratřejov, the channel of the Bratřejovka Brook cuts the sandstone strata and forms small gorge with rapids and rock fall on the rock faces. We propose this locality for registration as a geomorphologically and geologically outstanding phenomenon. It became evident that Pleistocene and Holocene geomorphological development of the Vizovická kotlina Basin was rather complicated and its explanation will require further research.

Left side tributaries of the Bratřejovka Brook flowing from the Klášťovský hřbet Ridge pushed by increased sedimentation the main course of the Bratřejovka Brook to the north and northwest. It resulted to gradual steepening of the right valley slope and origination of the morphologically distinct boundery of the Vizovická kotlina Basin. This slope belong to the Senická vrchovina Highland and is a part of the highland ridge between Vizovice and Ublo. The bedrock is built mainly by claystones and in the less extent by sandstones of the Vsetín Member of the Zlín Formation. Slope is very steep with intensive dynamics of slope processes (sliding) and short deep actively eroding tributaries. An interesting man-made landform is the uncompleted railway north of Bratřejov (Vizovice – Valašská Polanka – Lidečko) with many ramparts and cuttings; the railway had been constructed in the second half of 30s in the past century by businessman J. A. Baťa. The railway should have connected Zlín with the main railway leading to Slovakia through the valley of the Senice River. There is acting creep on the slopes of deep railway cuttings.

4. Results

Slope deformations and geomorphological characteristics of the landscape have been mapped in the area covered by map sheets 1 : 10 000: 25-32-25 a 25-32-24. The study area is prone to the activation of slope movements due to: • relief with high degree of horizontal as well as vertical dissection, • bedrock built by Paleogene flysch rocks of Zlín Formation with alternating strata of sandstones and claystones with different permeability, • high precipitation. Altogether 93 localities of slope deformations were identified in the study area (area 36 km^2).

Among these localities, 79 were classified as landslides (67 potential landslides, 12 active landslides). Rock falls were found at 5 localities (4 potential rock falls, 1 active rock fall). Surface creep of taluses and deluvium occurs at 9 localities. The following text explains the relationship between the distribution of various types of slope deformations and geomorphological setting of the study area. The most important localities with slope deformations are described in the text.

4.1 Sliding

Potential landslides are by their seating either surface ones (shear plane to the depth 1.5 m) and shallow ones (shear plane to the depth 5 m). They typically occur in the central segments of slopes at the Klášťovský hřbet Ridge and at its spurs. They occur bellow the steep structural upper slopes, where the slope inclination is smaller and slopes are covered with thick mantle of deluvium, wet patches and springs are numerous there. In this region, landslides also originate in the valley heads and heads of dells, where there are thick slope sediments and seepage of water (e.g. potential landslide Vysoké Pole-Skalice IV southeast of the summit of Rovně Hill reaches the width 170 m, length 550 m, surface is expressively undulating with sliding accumulations and wet patches, locality no. 1, Fig. 1).

Origin and development of potential landslides is linked with the particular phase of the geomorphic evolution of the area. An example is steep southern and south-eastern slope of the Senická vrchovina Highland, which bounds the Vizovická kotlina Basin, which is followed by the Bratřejovka Brook at its foothill. The course of the brook was pushed by the conspicuous alluvial fans of the left tributaries running from the Komonecká hornatina Mountains to the north, where it was undercutting the slope and conditioned the development of landslide along the whole length of the slope (e.g. landslide Ublo-Stráně I with the width 550 m and the length 220 m – locality no. 2, Fig. 1, landslide Ublo-Brtě I with the width 150 m and the length 300 m, locality no. 3, Fig. 1).

There are rather few active landslides in the study area. Part of them was initiated by the human activities. They mostly occur in the lower steep parts of the slopes in the Vizovická vrchovina Highland, where they are conditioned by the lateral erosion of streams (e.g. active landslide at the lower oversteepened part of the left valley slope of the Bratřejovka Brook with the width 450 m and the length 25 m, locality no. 4, Fig. 1). They also frequently occur in the wet slope dells (e.g. active tongue landslide Vizovice-Na Manském in the north-western part of the study area, width 38 m, length 70 m, locality no. 5, Fig. 1). Activation of the landslide with the width 120 m and the length 140 m close to the cooperative farm in Bratřejov (locality no. 6, Fig. 1) was conditioned by the dumping of a waste at the upper part of the older slope deformation. Dumping disrupted the slope stability. The enlargement works at the football playground towards the steep slope led to the activation of the landslide with the width 100 m and the length 32 m (locality no. 7, Fig. 1, Photo 3).

4.2 Surface creep

Structural slopes of the Klášťovský hřbet Ridge with scree cover are affected by the surface scree creep. The area affected by creep at the slopes of Ostrý vrch Hill (537 m) has the width 80 m and the length 200 m (locality no. 8, Fig. 1); creep areas west of the Papradná Hill (603 m) – locality no. 9, Fig. 1 and north of Ploština settlement are of comparable dimensions (locality no. 10, Fig. 1). Active creeping of soil occurs also at the steep slopes of old railway cuttings east of Ublo village.

Photo 3 Active landslide near the football playground in Bratřejov (Photo K. Kirchner)

4.3 Rock falls

Potential rock falls are connected with the sandstone rock outcrops which protrude at the summit parts of the Klášťovský hřbet Ridge. A typical example is rock formation at the Klášťov Hill (753 m) (length 10 m, width 3.5 m, height 3 m, locality no. 11, Fig. 1, Photo 4). Elongation of the rock formation in the NW–SE direction is conditioned by the joint system (mainly direction 40–220°). Many weathering microforms occur at the surfaces of vertical rock walls (honeycombs, rounded caverns), at the top surfaces are present pit holes (in detail see Kirchner 1989). The rock formation with the height 8 m protrudes from the main ridge southeast of Skalice Hill (708 m) – locality no. 12, Fig. 1. Rock surface is dotted by weathering microforms (rock niches, rock bench, Photo 5). The remnant of rock fall is found at the foothill of south-eastern rock wall – bouldery scree of sandstone and conglomerate of the Luhačovice Member. Other two localities with the potential rock fall are less conspicuous. Active rock fall is responsible for the form of the sandstone rock wall (3 m high) in the deep incision of the Bratřejovka Brook 1 km east of Bratřejov (locality no. 13, Fig. 1). The brook is incised into slightly inclined sandstone layers. Stepped rapids originated in the channel with embryonic evorsion features. These erosional fluvial forms are unique in the study area. There are instructive geological profiles on the walls of the incised channel. We propose to register this geomorphologically and geologically valuable locality Bratřejov – rapids for the registration as an outstanding geological locality.

Photo 4 Top part of the Klášťov Hill with sandstone rock formation. Many weathering microforms occur at the surfaces of vertical rock walls. Locality with potential rock falls (Photo K. Kirchner)

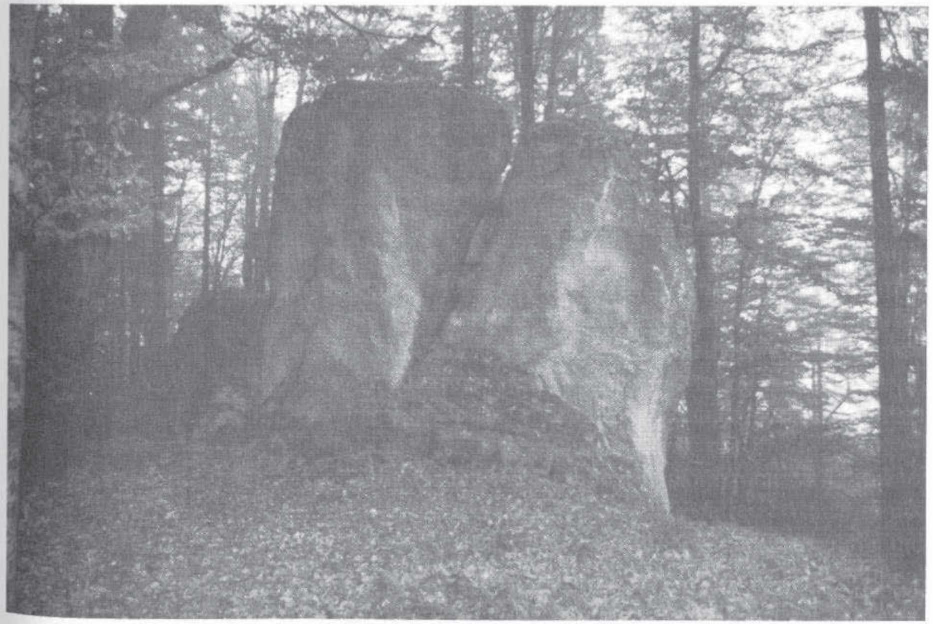

Photo 5 The rock formation Skalice (with the height 8 m) southeast of the Skalice Hill (708 m). Rock surface is dotted by weathering microforms (rock niches, rock bench). Locality with potential rock falls (Photo K. Kirchner)

4.4 Deep-seated slope deformations

Among a large number of slope deformations, we particularly mention 3 ancient slope deformations deeply (shear planes in a depth 5–20 m) and very deeply (shear planes more than 20 m deep) originated. It has not been proved until now, whether some underground cavities are developed there, as it is a case in the eastern part of the Klášťovský hřbet Ridge in the vicinity of Lidečko (Baroň 2001).

Deep-seated landslide with potential reactivation (locality no. 14, Fig. 1 – the Bratřejov-Rozepře landslide) came into existence in the valley head of a small brook north of the Suchý vrch Hill. Slope deformation has been developed on the contact of sandstone of the Luhačovice Member of the Zlín Formation and coarse-grained to medium-grained sandstones of the Lukov Member of the Soláň Formation. The surface of the slope deformation is strongly undulating with the huge block of soil and underlying bedrock, which forms the partial ridge in the altitude 575–580 m. Separation wall locally reaches the height of 10 m, the foothill is flanked with wet ground and springs. Overall dimensions of the slope deformation: width 220 m, length 200 m. One of the largest sliding areas in the study area is the locality Mezné northwest of the Klášťov Hill (locality no. 15, Fig. 1).

Slope deformation has originated on the contact zone between the sandstones of the Luhačovice Member and the Vsetín Member (predominantly claystones) of the Zlín Formation. It reaches the width 1 100 m and the length 500 m. The surface of the slope deformation is undulating, with partial blocks, which form the system of small ridges and parallel depressions. Slope deformation has probably the deeper structural seating. The separation wall conditions the existence of many springs and wet ground (Kirchner et al. 2003b).

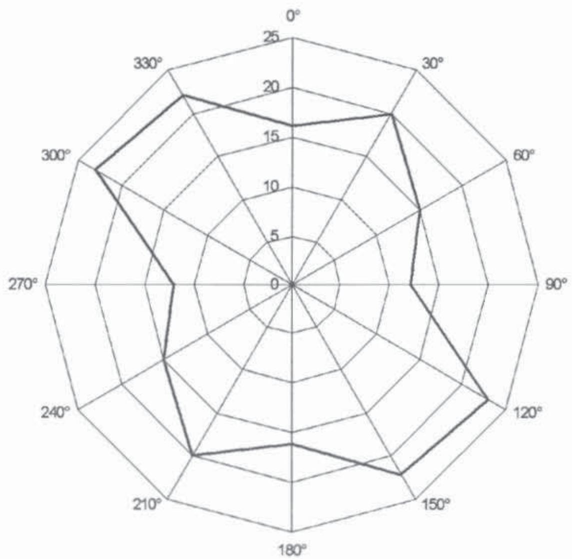

Fig. 2 Joint diagram – Stiny rose from upper part of the landslide Peklo (Hell). Rock scarp of sandstones is disrupted with joints of several directions

Photo 6 Upper part of the ancient+ slope deformation Peklo (Hell) near the Ploština settlement. Rock scarp of sandstones with the amphitheatre shape is really impressive (Photo K. Kirchner)

Morphologically unique is a deep-seated slope deformation Peklo (Hell) near the Ploština settlement locality no. 16, Fig. 1. It is 300 m wide and 900 m long. Rocky separation wall with the amphitheatre shape with the height of 50 m is really impressive. The scarp (Photo 6) is very steep at its closing part and has the form of rocky wall (inclination more than 50°). Rock walls are formed by the stepped layers of sandstones of the Újezd Member of the Zlín Formation (thickness 80–100 cm, dip 20–30° to the NW). There is the 10 cm thick layer of strongly weathered claystone at the base. Sandstone is disrupted with joints of several directions (Fig. 2: Joint diagram – Stiny rose). The following directions prevail: NW–SE 120–300° and 150–330° and perpendicular direction NE–SW 30–210°. Large blocks liberate along the joint systems, the claystone layer functions as a shear plane. Sliding combines with rock fall within this separating wall. Older down-warped block is in the contact with the morphologically distinct separation wall (inclination 30°), which is bordered by another separation wall, in this case with less distinct separation edge. The width of this block is 60 m and the length reaches 250 m. We infer from the morphology of the separation wall, which has rather homogenous morphology and forms the amphitheatre closing, that it was formed during some older phase of the slope movements.

The extensive accumulation with large blocks of soil is adjacent to the upper part of the landslide. Blocks have the character of slope ridges. Frequent phenomena are small ponds with organic deposits and wet ground. The lower part of the accumulation dammed the channel of the Vlára River in the past (source reach of the Vlára River). Younger channel is incised into the surface of the accumulation into the depth of 2.5–3 m. There is up to 40 m wide valley floor upstream the accumulation, which has been filled with organic sediments. Sediments most probably originated in the small landslide-dammed lake. Morphological diversity of this slope deformation and its unique occurrence in the study area deserves further detailed research. The main question is the recognition of the movement mechanism and the triggering agent of the block type slope movement.

The deep-seated slope deformations in the study area are connected on contact zone between different geomorphological resistent beds of the Zlín Formation and the Soláň Formation, development of slope deformation is conditioned as well as by convenient systems of joints and anticlinal position of flysch strata on the Čertovy kameny – anticlinal zone.

5. Conclusion

There have been registered 93 localities of slope deformations during the engineering-geological and detailed geomorphological mapping in the north-eastern part of the Vizovická vrchovina Highland. Slope deformations came into existence by the various types of slope movements – surface creep, sliding and rock fall. Simultaneously new facts about the landforms of the study area was gained, mainly about the complicated character of the foothill surface (pediment) in the Vizovická kotlina Basin. We had been seeking the links between the character of the abiotic environment (landforms and bedrock) and distribution and genesis of slope deformations. It means, we tried to understand the geomorphological aspects of slope deformations. The origin and the development of many landslides at the north slope of Vizovická kotlina Basin were conditioned by the movement of the Bratřejovka Brook channel to the north. The Bratřejovka Brook eroded its channel to the colluvial sediments as well as to accumulations of alluvial fans and created present day floodplain, which is bordered by a steep slope, which is favourable for the development of slope deformations. Chronology of the landform evolution would be possible only on the basis of the analyses of the larger area. The archaeological locality has been discovered during the mapping (prehistoric stone ridge at the Ostrý Hill). A locality of deeply incised channel of the Bratřejovka Brook with rapids and evorsion forms of high geomorphologic and geologic value has been proposed for the registration. From the viewpoint of mountain slopes development, the special attention was paid to deep-seated slope deformations, mainly to the slope deformation Peklo (Hell) in the vicinity of Ploština settlement, which is unique in the context of the Vizovická vrchovina Highland and represents geomorphologically extreme phenomenon. The research will continue at this locality with the adoption of similar approach.

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K ROZŠÍŘENÍ SVAHOVÝCH DEFORMACÍ V SEVEROVÝCHODNÍ ČÁSTI VIZOVICKÉ VRCHOVINY NA VÝCHODNÍ MORAVĚ

Résumé

V severovýchodní části Vizovické vrchoviny bylo doposud provedeno málo geomorfologických výzkumů, proto jsme se v rámci mapování svahových deformací (projekt geologických prací MŽP ČR „Svahové deformace v České republice“) zaměřili jak na poznání typů svahových pohybů a jim odpovídajících tvarů, tak na charakter abiotického prostředí a geomorfologii zájmového území. Inženýrsko-geologické mapování a vybrané postupy z podrobného geomorfologického mapování byly provedeny na mapových listech měřítka 1 : 10 000: 25-32-25 a 25-32-24, které zahrnují převážně ústřední část Vizovické vrchoviny (geomorfologický podcelek Komonecká hornatina) východně od Vizovic, která je tvořena paleogenními jílovci a pískovci zlínského a soláňského souvrství račanské tektonické jednotky magurského flyše. Práce probíhaly v období 2002–2003, doplňující průzkumy pak v létě 2004. Při mapování byly získány poznatky nejen o typech svahových pohybů, ale i o vazbách svahových deformací na charakter horninového prostředí a geomorfologic-

kých rysech oblasti. Získané poznatky umožnily analyzovat svahové deformace v kontextu reliéfu zájmového území a hledat vazby mezi rozšířením svahových deformací a charakterem abiotického prostředí krajiny. To znamená, že jsme se soustředili na geomorfologické aspekty rozšíření a geneze svahových deformací. Dalším výsledkem byly specifické poznatky o charakteru reliéfu zájmového území (např. charakter říční sítě, rozšíření kryogenních tvarů), které mají vazbu na vývoj reliéfu.

Zájmové území má všechny předpoklady pro rozvoj svahových pohybů: • reliéf s vysokou horizontální i vertikální členitostí, • skalní podloží tvořené flyšovými paleogenními horninami se střídáním různě propustných pískovců a jílovců, • vyšší srážkové úhrny. Na mapových listech (plocha 36 km^2) bylo zaznamenáno 93 lokalit se svahovými deformacemi. Z tohoto množství je 79 lokalit se sesouváním (67 lokalit s potenciálními sesuvy, 12 lokalit s aktivními sesuvy). Na 5 lokalitách se projevuje skalní řícení (4 lokality s potenciálním skalním řícením, 1 lokalita s aktivním skalním řícením). Povrchové ploužení skalních sutí a svahových sedimentů se projevuje na 9 lokalitách. Potenciální sesuvy jsou založením většinou povrchové (odlučná plocha se nachází do hloubky 1,5 m) a mělké (odlučná plocha do 5 m). Charakteristicky se vyskytují ve středních částech svahů Komonecké hornatiny a dílčích rozsoch. Začínají se vyvíjet pod lomem spádu příkrých strukturně podmíněných vrcholových svahů, kde je terén mírněji ukloněný s vyšší mocností svahových sedimentů, časté jsou pramenné vývory. Sesuvy se v této oblasti rovněž vyvíjejí v pramenných částech údolí a uzávěrech svahových úpadů, kde je větší mocnost deluviálních sedimentů a výskyt zamokření. Vznik a vývoj množství potenciálních sesuvů je spojen i s určitou etapou geomorfologického vývoje zájmového území. Příkladem je příkrý svah, omezující Vizovickou kotlinu (geomorfologický okrsek Zlínské vrchoviny), podél jehož úpatí protéká Bratřejovka. Její tok byl zatlačen výraznými náplavovými kužely levostranných přítoků z Komonecké hornatiny k S, kde vedl ke zpříkření svahu a vývoji sesuvů prakticky v celém jeho rozsahu. Strukturní svahy Kláštovského hřbetu s pokryvy suťových akumulací postihuje povrchové ploužení sutí. Na příkrých svazích starých železničních zářezů východně vesnice Ublo se projevuje aktivní ploužení půdního povrchu. Na pískovcové skalní útvary, nacházející se ve vrcholové části Komonecké hornatiny Klášťovského hřbetu, je vázáno potenciální skalní řícení. K typickým patří skalní útvar na Klášťově 753 m, skalka jihovýchodně vrcholu Skalice (708 m). Aktivní skalní řícení modeluje pískovcovou skalní stěnu (3 m výška) v hlubokém zářezu potoka Bratřejovka asi 1 km východně od Bratřejova. V korytě jsou vytvořeny stupňovité peřeje se zárodečnými evorzními tvary. Tyto fluviální tvary jsou výjimečné v dané oblasti. Tuto lokalitu cennou z geomorfologického i geologického hlediska navrhujeme jako evidovanou geologickou lokalitu. Z hlediska poznání rozvoje hornatinných svahů byla zvláštní pozornost věnována hluboce založeným svahovým deformacím. Zcela morfologicky jedinečná je hluboká svahová deformace Peklo nedaleko osady Ploština. Dosahuje šířky 300 m a délky 900 m. Impozantním dojmem působí odlučná skalní oblast amfiteatrálního tvaru s převýšením až 50 m a rozvojem aktivního skalního řícení a sesouvání. Mohutná sesuvná akumulace (rozsáhlé kry zemin a skalního podloží) přehradila v minulosti koryto potoka a vytvořila malé jezero hrazené sesuvem. Lokalita je ojedinělá v této části Vizovické vrchoviny a představuje geomorfologicky extrémní fenomén. I z tohoto hlediska bude studium v budoucnu pokračovat.