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Rozsah a morfologické účinky kvartérního zalednění v severním svahu
Jizerských hor
Extent and morphological effects of quaternary glaciation in the northern
slope of the Jizera Mts.

doktorská disertační práce - souhrn
PhD. thesis - summary

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ledovce. Stáří sedimentů ze dna Rybích louček vypovídá o tom, že ledovec podlehl deglaciaci již na sklonku pleistocénu.

The PhD thesis deals with paleogeographic reconstruction of glaciation in the Jizera Mts. The research was focused on issues, which were not satisfactorily solved yet: the continental glaciation extent, effects of the glacier impact on the recent relief morphology and a possibility of mountain glaciation. During the investigation additional questions about the method of Schmidt hammer measurements arose and were treated in a separate methodological study.

The aims of the research are:

- to delimit the maximum altitudinal extent of the continental glaciation
- to determine the influence of the quaternary glaciations on relief and identify its geomorphological and sedimentary evidence
- to contribute to resolve the issue of mountain glaciation in the Jizera Mts.

The present work consists of six articles that were published in refereed journals, or are going through peer review proceedings.

Maximum altitudinal limit of the continental glaciation in the granite part of the northern slope of the Jizera Mts.

- A. *JANÁSKOVÁ, B., KOUBOVÁ, M. (2007): Využití tvrdoměrných měření a analýz jílových minerálů pro určení trimline kontinentálního ledovce v severním svahu Jizerských hor. Acta Universitatis Ostraviensis, Geographia – Geologia 237, 10, 30-47.*
- B. *JANÁSKOVÁ, B. (in print): Reconstruction of the continental glaciation in the northern slope of the Jizera Mountains. Sborník geologických věd – Antropozoikum.*

Methods of trimline identification were applied in the northern slope of the Jizera Mts. The weathering limit separating ice-scoured terrain from frost-weathered areas was investigated using Schmidt hammer (SH) rebound testing and clay minerals analyses in article A. The results suggest that SH measurements combined with rock outcrops morphology can be used for glacial trimline mapping. The trimline was identified between „tors“ and „other outcrops“. The clay minerals analyses did not reveal as a perspective method for trimline identification.

In article B, the methods of SH testing, rock outcrops morphology mapping, blockfields mapping and weathering pits measurements were applied in six profile lines across the slope. The first three methods showed good evidence of weathering limit, while the latter proved unusable for trimline determination. The resulting altitude of trimline was delimited at 470-490 m a.s.l. With respect to the limitations and accuracy

of the methods, the trimline must be regarded rather as a zone ranging $\pm 20\text{m}$ from this altitude.

New findings on the method of SH measurements

- C. ČERNÁ, B., ENGEL, Z. (reviewed): *Variations of Schmidt Hammer rebound values on granite outcrop surfaces and below rock surface. Earth Surface Processes and Landforms.*

This paper presents SH measurements on intact and grinded surfaces and in subsurface vertical profiles. The main aims were to verify the influence of surface grinding on the results of SH measurements, to uncover how rock hardness changes with depth and to identify the age limitations of SH dating technique.

The results showed that grinding before measurement provides more accurate data. The increase of SH data range after grinding markedly emphasizes the variable degree of weathering. It was also proved that in shallow subsurface of the rock outcrops the R-value is stable. Therefore various depth of grinding can not affect the resulting R-value. The results from the subsurface vertical profiles indicated that SH rebound values change gradually from the bedrock surface downward. This means that the resolution of the SH as a dating tool decreases rapidly with increasing age of rock surface. This limitation can be mitigated using grinding before measurements, as it extends the effective measurement range of SH method.

Morphologic and sedimentary evidence of the continental glaciation in the Anděl Saddle

- D. ČERNÁ, B., NÝVLT, D., ENGEL, Z. (reviewed): *A glacifluvial paleochannel in the Anděl Saddle, Czech Republic: new evidence of the ice-sheet limit. Geological Quarterly.*

This study is focused on the area of Anděl saddle and the main aim is to prove the glacial sediment presence in this locality. Using geophysical methods, a sediment-filled paleochannel was determined to exist in the lowermost part of the saddle. The channel is eroded in solid bedrock and partly also in the regolith. Four drill holes were taken in the saddle. Sedimentary analyses demonstrated the glacifluvial genesis of the channel's sedimentary fill from a depth of 1–2 m downwards, while the topmost (1–2 m) layer was identified as colluvial. The minimum thickness of glacifluvial sediments in the channel is 14–15 m.

The ice sheet advanced to the saddle from the east (from Poland), entered the close proximity of the saddle at a minimum and its meltwaters drained to the west (toward the Czech Republic). The Anděl Saddle is the highest location with proven glacial sediments in Northern Bohemia.

The origin of rounded elevations in the foothills of the Jizera Mts.

- E. *JANÁSKOVÁ, B. (2009): The origin of rounded granite elevations in the northern foothills of the Jizera Mountains. Geomorphologia Slovaca et Bohemica 9, 1, 7-16.*

The paper E deals with the geomorphological effect of the ice sheet. The main aim was to prove the genesis of the rounded granite elevations in the northern foothills of the Jizera Mts. The direction of elongation, slope angles and joint orientations were measured on each elevation. The joint orientations were measured also at additional outcrops throughout the whole northern slope of the Jizera Mts.

The results show that the majority of elevations are elongated in the direction of the glacier advance, and that this is not predetermined by the joint system. The orientation of the gentle slopes corresponds to the stoss side in the majority of elevations. These results, as well as comparison with similar sites in the Czech republic, suggest that the elevations studied were glacially scoured.

Mountain glaciation in the Jizera Mts., Rybí loučky

- F. *TRACZYK, A., ENGEL, Z., JANÁSKOVÁ, B., KASPRZAK, M. (2008): Glacialna morfologia wierzchołiny Gór Izerskich w świetle badań w rezerwacie "Rybí loučky" (Republika Czeska), Landform Analysis 9, 129-133.*

The main aim of the paper F is to prove the mountain glaciation hypothesis in the area of Rybí loučky. This locality is situated in the summit parts of the Jizera Mts. and has a form of large slope depression with flat and wide bottom. Throughout the bottom GPR profile measurement was conducted. The results showed that it is filled by 1,5-2 m of organic-mineral sediment. In the north-east part of the depression the remains of ramparts were found, which can be regarded as a moraine showing the effects of ice or firn erosion. A drilling hole 198 cm deep was made in the bottom part of the depression. A sediment sample from the base was dated using AMS C14 method at 9936± 55 years BP.

The results indicate that the depression of Rybí loučky was supposedly glaciated during the Pleistocene. This landform is situated about 200-250 m below the altitude of cirques in the Giant Mountains. However, due to its leeward position and the presence of an extensive deflation source areas, it could be supplied by enough snow to produce a small cirque glacier.