APPLICATION OF ERT TO RECOGNISE THE GEOLOGICAL STRUCTURE OF CLIFFS LOCALISED IN SKALNY POTOK (HRUBÝ JESENIK MTS.)

Iwona STAN-KŁECZEK[1] and Dominika STAN[1]

[1]*University of Silesia in Katowice, Faculty of Earth Sciences, ul. Będzińska 60, 41-200 Sosnowiec, Poland; iwona.stan-kleczek@us.edu.pl*

Introduction

The Skalní Potok Nature Reserve is located within the highland range of Hrubý Jeseník Mts. (Eastern Sudetes) (Fig.1). The slopes within the reserve are steep (up to 35°) with many springs and outcrops of crystalline rocks, with a predominant majority of gneisses (Proterozoic) (Fediuková, Aichler, 2004). The successive remove of the weathered material in periglacial climatic conditions in the area with limited vegetation led to the preservation of the most resistant to deep weathering of outcrops with poorly developed divisibility of the rock. As a consequence of the effect is a rich variety of landforms (Pánek, Kapustová, 2016) which are now Pleistocene relicts (Demek, 1968; Demek, 1969; Křižek, 2016). The presented research included geometric measurements of vertical discontinuity zones and electrical resistivity tomography (ERT) of strongly weathered subsurface layers.

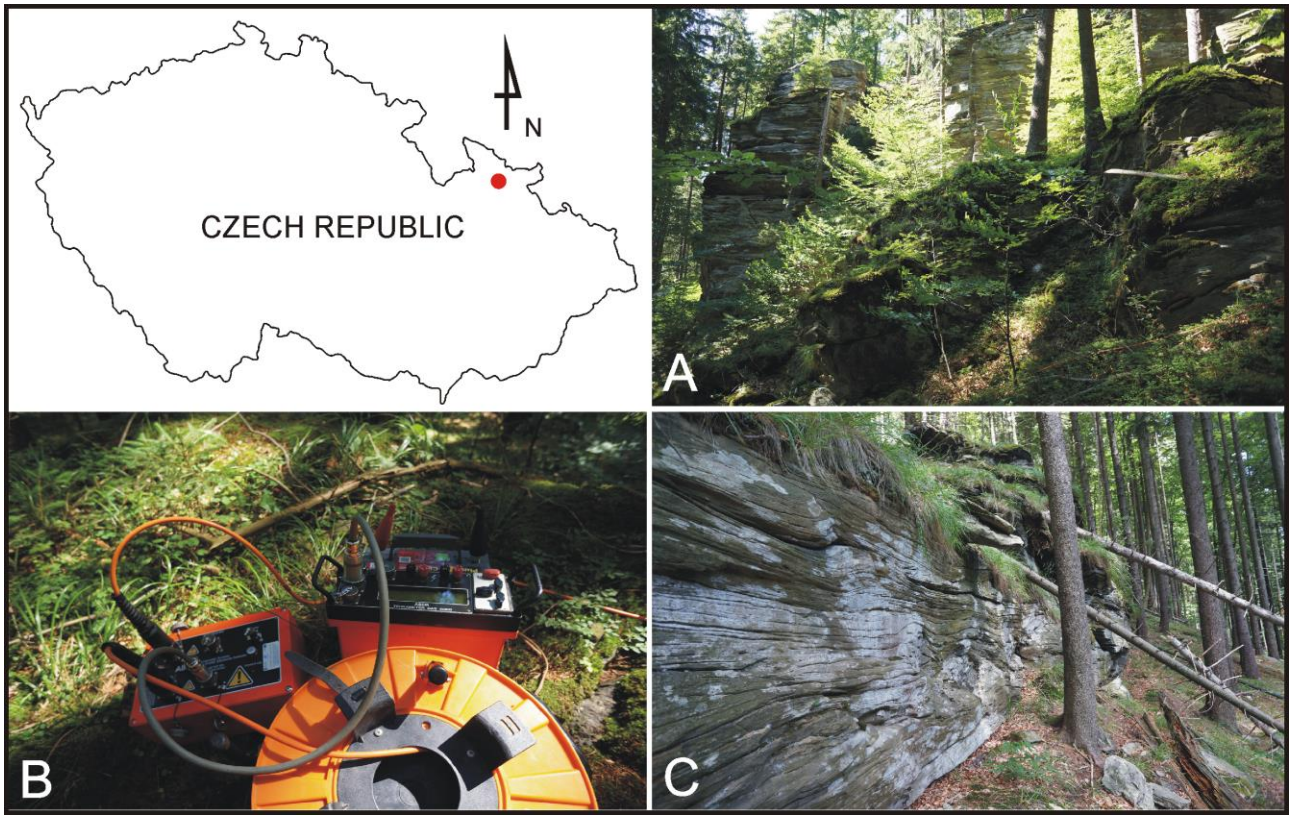

Figure 1. *Localisation of the Skalní Potok Nature Reserve: A – example of cliffs, B - ABEM Terrameter LUND Imaging System, C – example of crack surface.*

Samples and methods

In the studied area, in the period from August to September 2017 and from July to September 2018, geomorphological and geological mapping was performed to identify the highland forms. On the basis of visible outcrops and available exposures, such as frost cliffs and rocks, the rock types found there were

recognised. The fracture measurements were made on available rocks and cliffs. The strike azimuth and the dip angle were measured by a geological compass on randomly selected cracks in the walls of exposure. In order to illustrate the subsurface structures of rock, the electrical resistivity tomography (ERT) was used as a non-destructive and non-invasive method of measurement. The measurements were carried out with the ABEM Terrameter LUND Imaging System applying the Wenner-Schlumberger array. Three profiles S1 (815 m asl), S2 (775 m asl) and S3 (740 m asl) were made with the spacing of electrodes at 4 m, 2.5 m and 5 m respectively, which was dictated by area conditions. Profiles were made on a sloping, southern slope of the valley in accordance with the counter line. The interpretation was carried out using the RES2DINV software.

Results

In the area of the Skalní Potok Nature Reserve there are cliffs formed in the gneiss with the following orientation: NW – SE (3 cliffs) NNW – SSE (6 cliffs), NE – SW (1 cliff), W – E (1 cliff) oraz WSW – ENE (4 cliffs). Their orientation is related to the occurrence of primary discontinuity zones. In order to identify subsurface discontinuity zones within the gneissic cliffs, measurements of ERT were performed. Depending on the location of the profile, a two or three-layer model was obtained.

Conclusions

The research of cliffs located within the Skalní Potok Nature Reserve allowed to determine the main crack systems (NW-SE and NE-SW), which are responsible for the current valley morphology, confirming the superior role of the crack systems in their formation. Thus, the carried out comparative analysis made it possible to determine the main crack systems for gneiss of mountain range of Hrubý Jeseník. The ERT measurement indicated that despite the occurrence of primary discontinuity zones, the reactivated secondary fractures played a decisive role in the evolution of the valley, i.e. the development of the cliffs.

References

Demek J., 1968. Comarison of cryoplanation terraces in Siberia and Europe. Przegląd Geograficzny, Tom XL (2), 363-370.

Demek J., 1969. Cryoplanation terraces, their geographical distribution, genesis and development. Rozpravy ČSAV 79.

Fediuková E., Aichler J., 2004. Geologická Mapa ČR ark. Bélá pod Pradědem. Český Geologický Ústav, Praha.

Křižek M., 2016. Periglacial landforms of the Hrubý Jesenik Mountains. In. Pánek, T., Hradecký, J. (eds.), Landscapes and Landforms of the Czech Republic, Springer, Cham, 277-289.

Pánek T., Kapustová V., 2016. Long-term geomorphological history of the Czech Republic. In.Pánek, T., Hradecký, J. (eds.), Landscapes and Landforms of the Czech Republic, Springer, Cham, 29-39.