Morphotectonic research of the East Sudeten in the Czech Republic and monitoring of present-day tectonic movements

PETRA ŠTĚPANČÍKOVÁ[1], JOSEF STEMBERK[2]

[1] Charles University in Prague, Faculty of Science, Department of Physical Geography and Geoecology, Prague, Czech Rep.
[2] Academy of Science of the Czech Republic, Institute of Rock Structure and Mechanics, Department of Engineering Geology, Prague, Czech Rep.

1. Introduction

The area under study is the Rychlebské hory Mts. in the southeastern part of the Sudetic ranges (Figs 1 and 2), which are bordered by the Marginal Sudetic Fault (MSF). The area is tectonically active (with weak earthquakes) and comprises morphologically distinct faults manifested as fault slopes, facets etc. (Fig. 3). The research follows the investigation carried out in Poland. Measurements available in the adjacent area supporting the morphotectonic research are as follows: precise geodetic levelling, gravimetric data and GPS measurements.

2. Morphotectonic research and methods

The morphotectonic research involves geomorphological mapping, morphostructural analysis, morphometric methods to identify tectonic landforms (Fig. 4) and geological methods, e.g. structural measurements, and investigation of Quaternary glaciation (Photo 1). Geophysical methods support identifying of tectonic discontinuities as well. 3D monitoring of tectonic micro-movements (Photo 2) is carried out in order to assess the present-day tectonic activity. All data are processed in GIS.

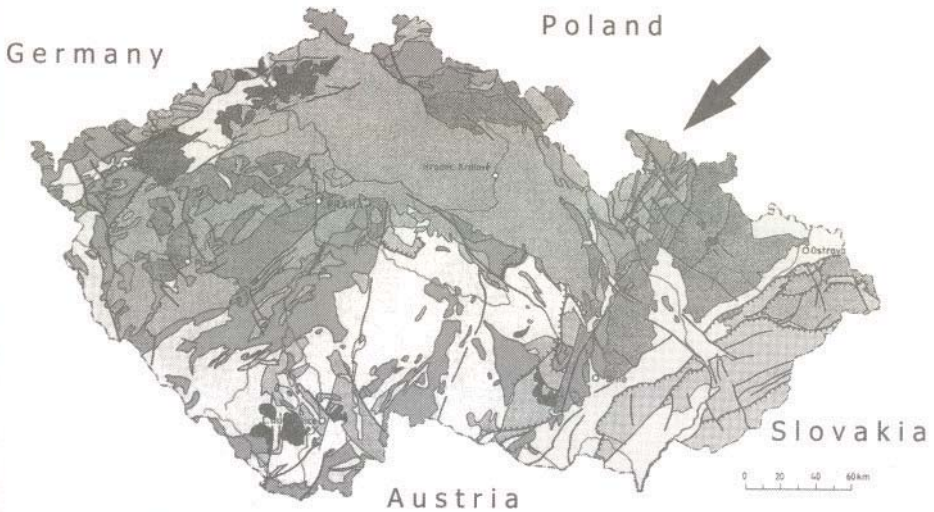

Fig. 1 Position of the studied area on the geological map of the Czech Republic.

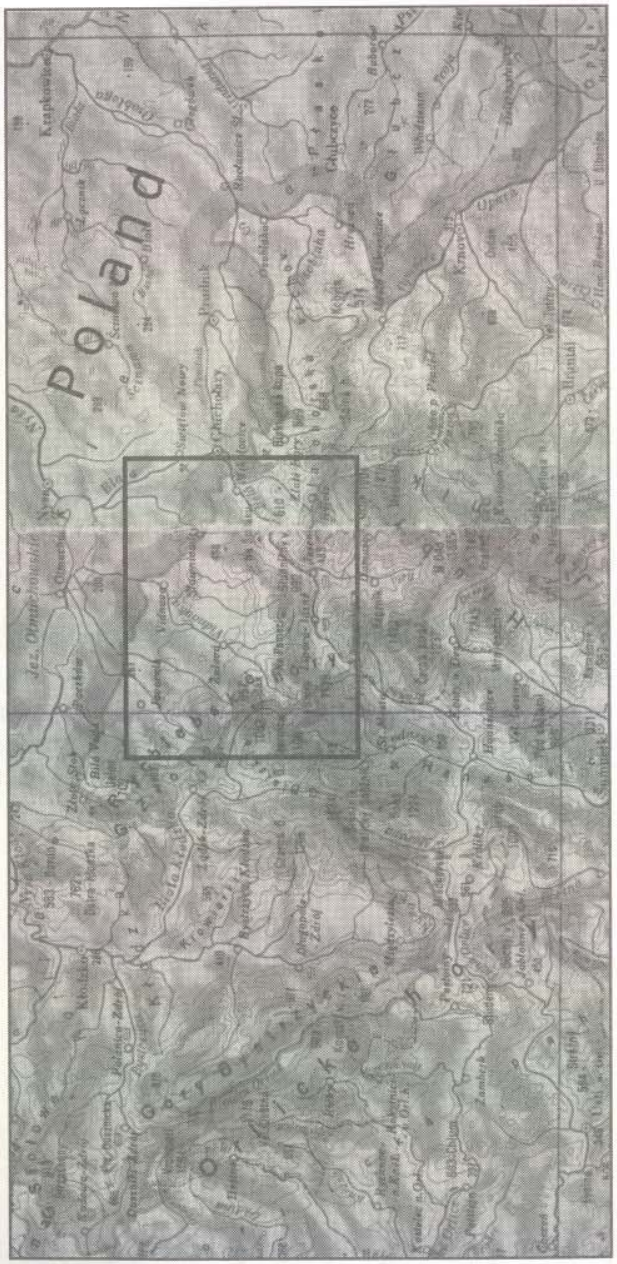

Fig. 2 More detailed location of the area represented by the Rychlebské hory Mts.

3. 3D monitoring of tectonic microdeformation

The monitoring is carried out by means of the deformometer TM-71 in two carst caves (Fig. 5). Measuring the underground provides more stable conditions (Fig. 6, Photo 3) and enables to eliminate the influences of superficial slope processes on the measuring. 3D monitoring makes possible to measure dilatation or contraction of the fissure – axis *x*, movements along the fissure (strike-slip) – axis *y*, and vertical movements – axis *z*. Measurements are correlated with natural and induced seismic events, data on precipitation and temperature in order to uncover tectonic causes of the measured movements.

4. Conclusion

The morphotectonic research can be accepted as an effective tool particularly in geologically complicated areas. It contributes to the determination of the Late Tertiary and Quaternary evolution of the studied landscape. Precise monitoring of tectonic movements enables to assess present-day tectonic activity and to quantify current geomorphological processes.

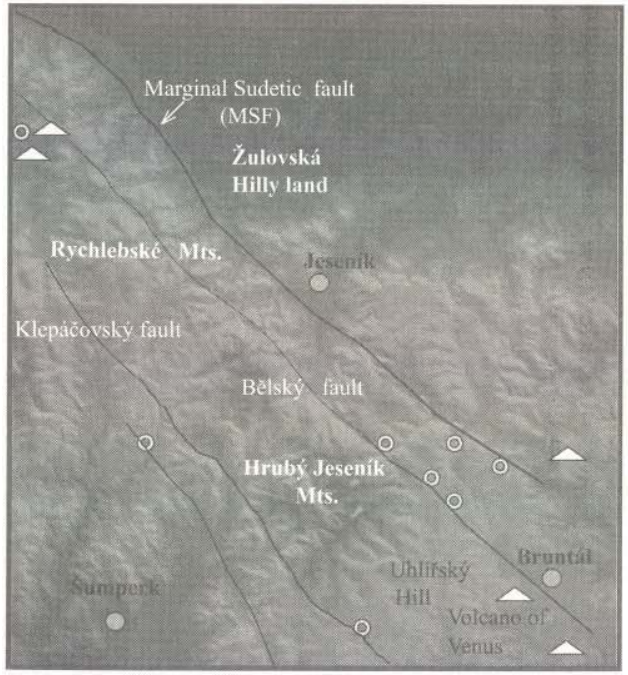

Fig. 3 Display of active tectonics in the relief of the surrounding area

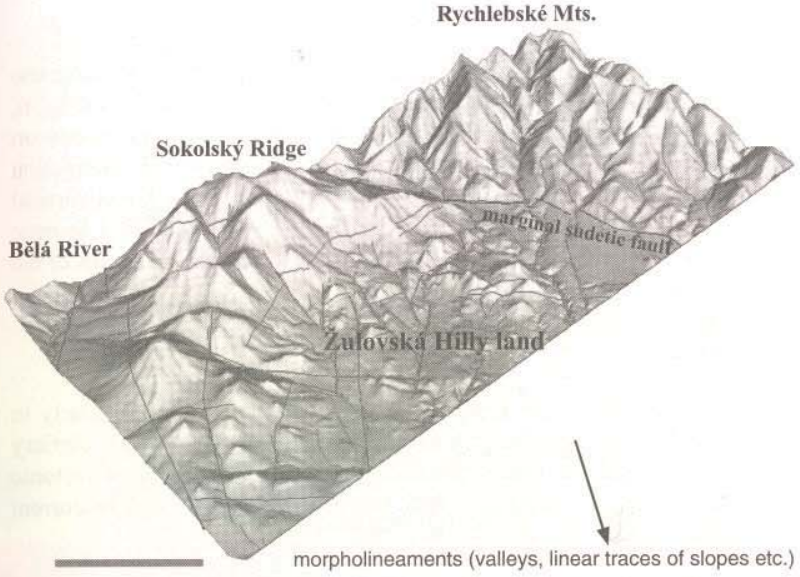

Fig. 4 Digital elevation model as an effective tool of morphostructural analysis

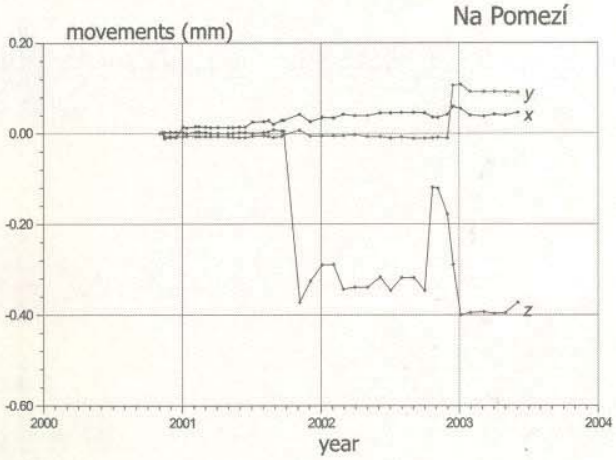

Fig. 5 Example of processed results of measurements. In the cave Na Pomezí vertical movements are noticeable

Acknowledgements

This work was supported by the Grant Agency of the Charles University in Prague, No. 328/2004/B-GEO/PrF, and the Czech Ministry of Education, Youth, and Physical Culture, project COST OC 625-10.

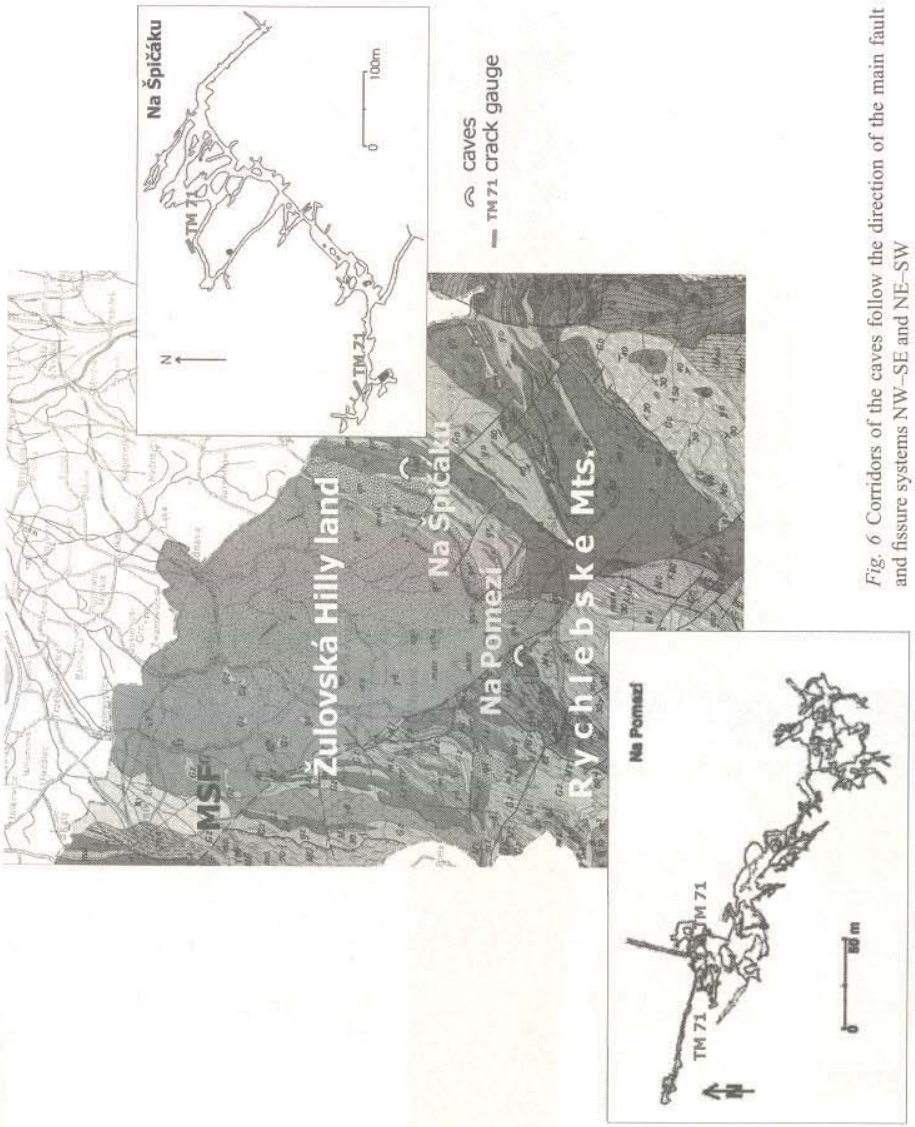

Fig. 6 Corridors of the caves follow the direction of the main fault and fissure systems NW–SE and NE–SW

References

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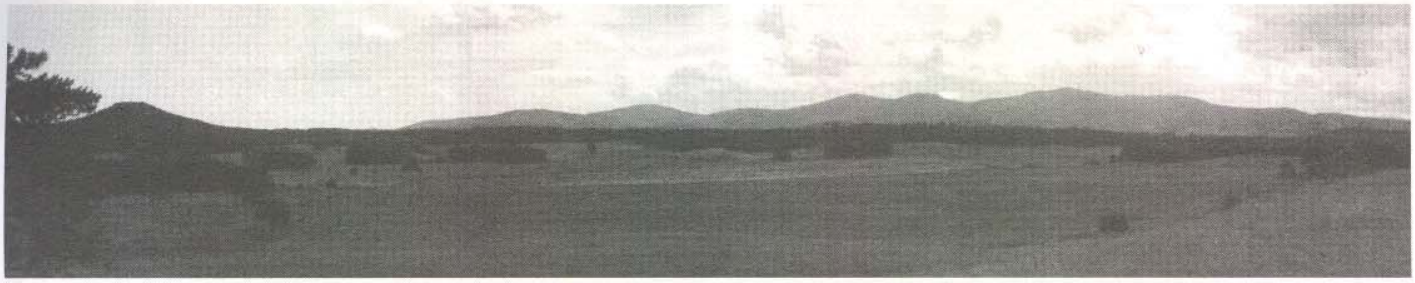

Photo 1 Distinct marginal slope of the Rychlebské hory Mts. (in the background) and the Žulovská pahorkatina Hilly Land formed by granitic inselbergs and remodelled by the Pleistocene continental glacier

Photo 2 Crack gauge TM-71 across the fissure in the cave

Photo 3 Surface above the cave Na Špičáku and a slickenside on the main plane NNE–SSW