

Abstract

The presented PhD thesis deals with present-day geodynamic processes in the southwestern part of Broumov Highland, with a special attention paid to the seismoactive Hronov-Poříčí Fault Zone (HPFZ). Compared to the rest of the Bohemian Massif the studied area exhibits relatively increased level of tectonic activity, which is evidenced by local seismicity and by presence of CO₂-rich mineral waters. The present-day activity of geodynamic processes is studied by means of various geomorphological, geotechnical, geophysical and hydrological methods. Following processes and features were studied: activity of slope movements, seismic activity, present-day tectonic movements, relations between landforms and joint and fault tectonics. Based on the previous experience obtained by the author in the seismoactive area of Western Bohemia, groundwater observational network was set up in deep boreholes, in order to detect anomalies related to the tectonic activity of the studied area.

The thesis represents a contribution to the deeper understanding of the studied area and also a contribution in respect of possible applications of some new methods that can be used in research of zones with relatively increased tectonic activity inside of stable areas of Central Europe. From geomorphological point of view, the most important are the new findings about the tectonics of HPFZ and quaternary tectonic movements in its broader area. Using the field geoelectric survey the presence of a fault parallel to the main overthrust of HPFZ was detected. This fault represents a boundary between the ridge of Jestřebí Mountains and Rтынě Furrow. In addition to that, a more detailed study of the river network morphology and geographical distribution of quaternary terraces of the Úpa River gives a clear evidence of young, quaternary tectonic subsidence of Rтынě Furrow. From the point of view of studying the endogeneous geodynamic activity, the main contribution is an implementation of the groundwater observational network, focused on a detection of possible indications of local seismotectonic activity. A highly sensitive location – VS 3 borehole close to Teplice nad Metují – was found. Anomalous fluctuations of water level were identified in this borehole before earthquakes at August 8, 2005 ($M = 2.4$) and October 25, 2005 ($M = 3.3$). In both cases the anomalies exhibited clear precursory character. Further anomalous changes in groundwater level were observed in the first half of 2006. In this case the anomalous behaviour most likely represented a response to the aseismic movements along the HPFZ. All these positive results justify the method as applicable, when studying the tectonic activity, including possible earthquake precursors, in relatively stable areas, like Bohemian Massif.