

The origin of deformation bands in the Silesian Nappe (Bieszczady Mts.) and a novel microtectonic approach to paleostress reconstructions

Bieszczady Mountains are the part of the Carpathian orogenic belt. Their unique character attracts numerous tourists but also conceals numerous scientific secrets. The Bieszczady Mts. owe their unique character mainly to geological processes. The history of these processes were written down in the geological rocks layers building Bieszczady Mts. The rocks were deformed during last global extensive mountain building event known as Alpine orogeny. The results of that event took a form of tectonic structures such as folds and faults, which can be observed within Bieszczady Mts. However, deformation structures can come in all sizes. For instance, an example of micro-scale structures are deformation bands. Despite their size, they occur in clusters what makes them easily noticeable. They are of special importance in geology, because on the basis of their properties we can infer about the course and conditions of regional tectonic processes. Deformation bands are also found in the Carpathians, including Bieszczady Mts. region within a geological unit called the Silesian Nappe.

The main goal of the research is to present the tectonic history of the Bieszczady Mts. from the perspective of the microtectonics. Determination of deformation bands origin, will help to understand the regional deformation mechanisms and the conditions in which they occurred. By proposing a novel set of complementary research techniques, it is planned to present a method that will allow to reconstruct paleostresses, thereby reveal the secrets of deformations, such as its direction or relative timing of its occurrence.

It is proposed to use a combination of research methods including field and laboratory studies, as well as linking traditional and modern analytical techniques. Field studies will be supplemented with detailed digital terrains model analysis in order better recognize the occurrence of deformation bands. Traditional laboratory tests involving examination of deformation bands and host rocks using optical and electron microscopy will be supplemented with the use of computed tomography techniques known from other fields of study such as medicine. By its application, it will be possible to examine 3D internal structure of the rock, and thus the nature of deformation with a high precision. In addition, it is planned to study the spatial differentiation of physical properties of rocks and deformation bands such as the ability to conduit fluids.

The outcome of the proposed studies will improve understanding of regional geology and the nature of deformation bands. Novel approach to paleostress reconstructions will contribute to researches carried not only in the Carpathians but also in various places around the world. The results will contribute to the development of structural geology and will find application in the studies on petroleum deposits, which are localized within the folds in studied area.



Deformation bands
in the Bieszczady Mountains