

Dissertation Review

Candidate's Name: **mgr Agnieszka Braclawska**

Dissertation Title: **Wpływ aktywności sejsmicznej łuku Karpat oraz Wschodnich Alp na występowanie silnych zjawisk sejsmicznych w Górnośląskim Zagłębiu Węglowym**

Reviewer's Name: prof. Dr. Zdeněk Kaláb, PhD.

I was asked to prepare a Review on the above-mentioned dissertation by letter from the Dean of the Faculty of Natural Sciences, University of Silesia in Katowice, prof. dr hab. Leszek Marynowski (16 March 2021). The topic of the dissertation belongs to the field of Earth sciences, especially to the field of seismology. The main goal of the dissertation is to contribute new knowledge to the evaluation of the influence of intensive natural earthquakes in the surrounding areas of Upper Silesian Basin on the occurrence of very intense seismic events in the Upper Silesian Basin, where intensive mining work takes place, usually at great depths. The topic is current; it is included in basic research with an overlap in applied research. The reported research is an original contribution; the research is satisfactory in its method, in the quality and coherence of its expression.

Submitted above mentioned dissertation was divided into obvious main parts, i.e. literature search, definition of main and partial aims of the dissertation, definition of used methods, experimental calculations, and discussion of obtained results. The size of the dissertation is 171 pages; it contains an extensive list of references, 77 figures and 19 tables.

Literature search is extensive material that documents very good orientation of candidate in the given problem – natural and mining induced seismicity and related geological topics. This part of the research is devoted to the geological structure of areas of interest using current and older scientific published works (Chapters 2 -3). Tectonic patterns or model studies of the geological development of areas are also part of these chapters. These chapters summarize all current knowledge and I consider it as compact material.

Chapter 4 (Methodology...) summarizes the basic procedures used for the analysis, synthesis and evaluation of data for the given goal. The chosen procedures are correct and made it possible to assess the obtained results from the point of view of the goal. The calculation of magnitude or energy is still the subject of research and discussion by seismologists. Generalizations / recalculations

of variously calculated energy parameters often provide misleading or poor values. For future research, I recommend to pay more attention to this (Chapter 4.4).

Chapters 5 and 6.1 describe database sources of seismological data. Many national and international databases are used; the obtained data are presented in maps and summary tables. Input data for individual investigated areas are not specified, with the exception of the ten "strongest" earthquakes listed in Table 14. The main problem is taking over and unifying data from different databases and also at different times: databases are corrected, both coordinates and energy characteristics. For example, currently (April 2021) earthquake No. 10 located originally in the Czech Massif with magnitude 6.0 is only magnitude 4.9, the coordinates are also different (ISC currently indicates the location of about 250 km from the original location). Source data and methodology of their preparation (source, compilation, and unification) is not the subject of the dissertation, so in the next part I deal with the evaluation by processing the presented data, i.e. a model study of the approach to the evaluation of the task. The analysis is performed by the candidate over a long period of time (30 years), for processing of mentioned period it is recalculated to suitable 100 day intervals. This allows to process and to evaluate trends in individual dependencies.

The results themselves - analysis of seismicity in individual areas and subsequent synthesis of knowledge and their interpretation / evaluation, including influence on strong seismicity in the Upper Silesian Basin - are the content of chapters 6.2 - 6.4 and 7. The research consists of visual (description of character) and numerical evaluation based on epicentre maps in individual areas and trend curves. There is a minimum of errors in the dissertation (e.g., the use of Peška vs Peska in the text, Figure 62 does not apply to Table 11 ...). The descriptions of the obtained results are clear and sufficient. The main conclusions are summarized in the last chapter. Generally, it can be stated that the conclusions correspond to the analysis and synthesis of dissertation data.

Questions for candidate:

1. What is the candidate's opinion on the influence of mining activities on the occurrence of the most intensive seismic events? It is generally accepted that mining activity is crucial not only for the overall seismicity of the area, but also for the most intensive mining induced events / rockbursts.
2. Trend curves are converted to a "mean value" before interpretation. It is not clear from the dissertation how the individual sub-intervals are determined in the original trend curves? "Vertical intervals" are omitted from the comment.

3. In the dissertation, the time interval between the occurrence of a strong earthquake and the subsequent increase of seismic activity in USB is discussed. What time interval is still acceptable for us to claim to be the result / cause of an earthquake?

The dissertation is clearly divided and the structure is logical. Tables and figures complement the text appropriately and allow the reader a good orientation for the use of the work as a basis for their own research. Despite the above comment regarding the input data, the work can be evaluated positively and its results can be used for further research activities. New findings can be seen in the implementation of experimental calculations and their subsequent interpretation. From her own papers, the candidate presents two journal papers presented at WOS in co-authorship (Contemporary Trends in Geoscience, Open Geosciences).

The submitted dissertation “**Wpływ aktywności sejsmicznej łuku Karpat oraz Wschodnich Alp na występowanie silnych zjawisk sejsmicznych w Górnośląskim Zagłębiu Węglowym**” meets the requirements according the Polish Regulation , therefore, I recommend to accept the dissertation presented by **mgr Agnieszka Braclawska** to be awarded by the degree Doctor of Philosophy.

Ostrava, 5 May 2021



Prof. Dr. Zdeněk Kaláb PhD., President of Czech Association of Geophysicists (CAAG)
Institute of Geonics; Czech Academy of Sciences, Studentska street 1768, CZ-70800, Ostrava - Poruba, Czech Republic
also: VSB - Technical University of Ostrava, Faculty of Civil Engineering, Dept. of Geotechnics and Underground Engineering