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Review of doctoral dissertation

Title of doctoral thesis:	The Origin of Deformation Bands in the Silesian Nappe (SE Poland)
Author:	Piotr Jan Strzelecki
Field of science:	Natural Sciences
Scientific discipline:	Earth and Related Environmental Sciences
Supervisor:	Prof. dr. hab. Anna Świerczewska
Institution:	AGH University of Sciences and Technology Faculty of Geology, Geophysics, and Environmental Protection

Summary of the thesis

This Doctoral Thesis presents new structural data related to deformation bands from the Silesian Nappe (SE Poland) and discusses the possible mechanism for structural diagenesis and pure compaction deformation bands.

The Review of the PhD Thesis has been prepared according to an agreement with AGH University of Science and Technology, Faculty of Geology, Geophysics and Environmental Protection in Kraków, represented by Chairman of the Council for Scientific Discipline, Earth and Environmental Sciences (Przewodniczący Rady Dyscypliny Naukowej, Nauki o Ziemi i Środowiska) prof. dr hab. inż. Jacek Matyszkiewicz (Dean of the Faculty), in connection with the procedure of granting Piotr Jan Strzelecki the title PhD, conducted by AGH University of Sciences and Technology Kraków.

The reviewed dissertation consists of six numbered chapters written on 105 pages with Abstract in Polish and English, Reference List, List of Table, List of Figures, and Appendix. Chapter 1 gives a short introduction to the deformation bands, motivation, aims, and basic information on the thesis. Chapter 2 presents the geological background for the study, mainly focusing on the introduction of Outer Western Carpathians and Silesian Nappe. Chapter 3 introduces the material used and analytical methods applied in this study. Chapters 4 and 5 present the results of structural diagenesis and the deformation bands. Chapter 4 is an integrated petrographical, geochemical, and structural geology research oriented to the history of deformation and diagenesis of the Silesian Nappe with emphasis on deformation bands. Chapter 5 deals with the specific types of deformation bands in the study area. The outcome of this chapter is the discovery

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of the factors controlling the occurrence and formation of deformation bands, their origin, and implications. Chapter 6 contains important concluding remarks on the PhD thesis. In addition, the dissertation contains 4 tables, 41 figures, and a rather long list of references (14 pages).

Specific comments and questions

Chapter 1. "Introduction" is clearly written, I have no complaints about it. It shows that the author is well-versed in the subject of deformation bands.

Chapter 2. "Geological Setting". I would expect the author to first describe the entire Outer Western Carpathians, and then concentrate on his study area. It would probably be more appropriate to use the zoom-in approach when writing. It is important for readers who are not so familiar with the Carpathian geology or Outer Western Carpathian geology. Certainly, a tectonic map of the entire Outer Western Carpathians would be appropriate and awesome. Note: The official name of the mountains is "Western Carpathians" or "Outer Western Carpathians" not "Western Outer Carpathians" etc. Please do not mix these terms!

In Fig. 2.2. – the indication of the geological section is missing, although the world sides are given.

Chapter 3. "Material and Methods". I do not have any comments.

Chapter 4. "Structural Diagenesis" is neatly written. There are some shortcomings.

In Fig. 4.1 the legend shows the stream Solina, the correct name should be Solinka.

In Fig. 4.3. the lower part contains a low-angle normal fault system after the tilt test. Is this true, or can these fault slips be interpreted as reverse faults after tilting? It is not clear in the Figure which data is shown. I assume that these fault-slips are related to the thrust faults shown in Fig. 4.5. because the geometry of fault planes and striae is the same and the principal palaeostress axes are oriented the same as for the RTF stereograms in Fig. 4.5.

In Fig. 4.5. – Once again, it looks like the reverse faults have failed the tilting test. For example, see a mix of the reverse faults and low-angle normal faults on the upper right side of the RTF stereograms.

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Chapter 5. "Pure Compaction Bands". Section 5.1 states that all PCBs were restored to a normal position relative to the horizontal position of the bedding. Does this mean that all the observed DBs are developed before the folding? The direction of shortening is NE–SW. Practically only data from one locality are slightly different (170–350 trend). However, it is a locality that is of a different structural position and further NE from the other localities.

In several places in the text the use of the Stratigraphic Code, also known as Hedberg's Code, is not strictly adhered to. I am aware that the author has taken terms from works written in the past, often poorly translated from Polish, Slovak, Czech, or Ukrainian into English. However, lithostratigraphic units are written always with the capitalized first letter.

A group name combines a geographic name with the term ''group,'' and no lithic designation is included; for example, Gelnica Group.

A formation name consists of a geographic name followed by a lithic designation or by the word "formation", for example, Krosno Formation, Dachstein Limestone.

All member names include a geographic term and the word ''member''; some have an intervening lithic designation, if useful; for example, Otryt Sandstone Member (with Member at the end).

The names of beds or flows combine a geographic term, a lithic term, and the term ''bed'' or ''flow;'' for example, Knee Hills Tuff Bed, Ardmore Bentonite Beds (with Bed, Beds, or Flow at the end).

We should all strictly adhere to this. In this case, the Otryt Sandstone is the Otryt Sandstone Member because it is a member of the Krosno Formation. The same case: "The Lower Krosno Beds" is not the same as the Otryt Sandstone Member. The bed, beds, or flows have a lower status than members.

In Section 5.4., the mathematical variables should be italicized both in the text and in the formulas, for example, on pages 69, 70, 72, and others.

The mathematical relation $\sigma_1 > \sigma_2 > \sigma_3$ for palaeostress axes ratio is not entirely correct, the correct one should be $\sigma_1 \geq \sigma_2 \geq \sigma_3$ (page 69).

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In Fig. 5.13 – It is not so clear, which data were used as input for the calculation. However, it appears that the author used diameter, not radius in the calculation. See values in Table 4.1. or Table 4.2, respectively.

Chapter 6. "Summary". The summary at the end of the dissertation is rather vague. This is also caused by the structure of the individual chapters, which is not standard. I realize that partial conclusions are given at the end of chapters 4 and 5. Nevertheless, I think that the conclusion of the thesis should be more specific.

At the end of this section, I would like to ask two questions. What possible problems/limits did the author encounter during the creation of the dissertation or the research itself? How do the results obtained from the study of deformation bands correlate with the results of the fault-slip, fold, and vein analyses? What does the author see as the practical use of the results of his work and for what *p-T-t* conditions?

Conclusions

The reviewed doctoral thesis written by Piotr Jan Strzelecki represents a valuable scientific contribution, showing that the candidate has achieved a high level of scientific knowledge on the deformation bends and geological evolution of the study area. I am satisfied that the student has successfully mastered many methods of geological and analytical research, which were useful for the tectonic interpretation of the Silesian Nappe System. The manuscript meets the requirements for a doctoral thesis, and I herewith confirm with pleasure that Piotr Jan Strzelecki can be admitted to the further stages of the dissertation process.

Bratislava, Slovakia, 25th August 2023

Assoc. Prof. Rastislav Vojtko, Ph.D.