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Solid Earth Discussions

Interactive comment on "Magnetic properties of pseudotachylytes, Jämtland, central Sweden" *by* Hagen Bender et al.

Anonymous Referee #1

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In its present shape, the manuscript requires major revisions before being possibly published in Solid Earth.

What is the message of the paper? The objectives are not clear at all.

The structural analysis is confused and the conclusions are neither exciting nor convincing.

Although I am not a specialist of rock magnetism, the same can be said regarding the magnetic analysis (see below).

1/ Comments on structural analysis

As a structural geologist and regular reader of Solid Earth, I am disappointed by the

structural analysis of pseudotachylyte-bearing fault zones presented here. Particularly, shear senses are poorly constrained and explanations are somewhat confusing. Clarification and reformulation are needed.

The pst (pseudotachylyte) macroscale is somewhat disappointing. Photographs are scarce and poorly informative. PST microscale description is confused. Pst microscale description should consist of a description of matrix, newly crystallized minerals, survivor clasts and other specific features (sulfide droplets, flow folds and so on).

Lines 32-34 : why is it important to compare the pst data with kinematic data from post-orogenic extensional faults?

Lines 65-69 : the authors state that ''mylonitic shear sense indicators ... were not observed". Can this missing information be found in the literature? How can the authors discuss the evolution of the nappe complex (with in-sequence and out-of-sequence thrusting and so on) if the early kinematics are unknown?

Lines 72 and following. Fractured fault rocks are not fault rocks, they are usually referred to as ''fractured host rock" or fractured protolith". My feeling is that altered pst should not be distinguished from unaltered pst in the fault rock catalog, since formation is the same for both psts.

Lines 79-80 : ''Deflection... respectively" : this sentence is confusing. No photograph of the structures used for establishing the sense of shear. What injection vein asymmetry do the authors refer to?

Lines 81-84 : what are these N-S faults? Do they cross-cut the thrust-sheet bounding faults? More generally, what is the relationship between pst and pst magnetism and those late-stage high-angle normal faults???

Line 160 : what is the meaning of the sentence ''Only ... pseudotachylyte"?

Lines 165-166 : is calcite a secondary, newly formed mineral? If yes, it is not a survivor clast. Please clarify. It seems that calcite has nothing to do with pst formation. It should

be described separately from psts. And what is the usefulness to describe calcite that has nothing to do with pst as well as with pst magnetic properties???

Line 170 : could it be sanidine?

2/ Comments on magnetism analysis

Given the poor quality of the manuscript, I cannot spend time checking the magnetic side of the analysis presented in the manuscript. Data look scare and poorly understood. Conclusions are not exciting. The authors fail to apply the Ferré et al analysis leading to the reconstruction of focal mechanisms of pst-generating earthquakes.

Line 282: What is the meaning of this sentence ‘’Fault vein margins. . .fault zone”. What does ‘’Seismic faulting in these veins” mean? The remaining part of this section (lines 283 to 296) is confusing and should be seriously reconsidered.

3/ Phrasing concerns

Line 36 : what is a magmatic assemblage in a pst? I would use ‘’neoformed” or newly crystallized” or something like that since a pst is not exactly a magmatic rock.

Line 37 : delete ‘’commonly”.

Line 58 : What is a calcareous volcanic rock?

Line 60 : I cannot understand the meaning of ‘’their strike follow the shape of the synform”. Please reformulate.

Line 66 : the lineation is not carried by biotite and boudinaged amphibole, it is carried by a foliation.

Line 91 : add ‘’to” after ‘’parallel”.

Line 97 : replace ‘’is” by ‘’are”.

Line 146 : I do not like ‘’Microstructural appearance of host and fault rocks”. Better use more accurate words.

Line 148 : I do not feel confortable with ‘’porphyroblastic biotite”. Porphyroblasts commonly consist of feldspar, garnet, staurolite and so on. I doutd that biotite can form prophyroblats.

Line 152 : Which cataclastic fault rock do you refer to?

Line 162 : I would replace ‘’partial melting” by ‘’melt corrosion”.

Lines 179-180 : the sentence is unclear and is redundant.

4/ Other issues

A lot of references are cited in the text but miss in the list. Please complete.

Photomicrographs are in some cases poorly legible. Some annotation or drawings could improve legibility. Captions are not helpful and should be reformulated.

For instance, line 450. Caption of Fig. 3 is unclear. ‘’Figure 3. Macroscopic appearance of a foliation-parallel fault vein exhibiting different kinds of fault rock. For detailed description, see text. Characterization of fault rock types is also based on microscopic observations. The image represents the XZ plane of the ductile finite strain ellipsoid.” A fault vein consists of pst, not of different kinds of fault rocks. What the ‘’ductile finite strain ellipsoid”? Why not the brittle one? Psts are brittle structures.

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