Solid Earth Discuss., 7, C315–C317, 2015
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Interactive comment on "Polyphase evolution of a crustal-scale shear zone during progressive exhumation from ductile to brittle behaviour: a case study from Calabria, Italy" *by* E. Fazio et al.

Anonymous Referee #1

Received and published: 31 March 2015

I had a very though time reading this script, trying to evaluate it, and consequently organizing my review. Unfortunately the reasons for a complicated review are numerous and of such an impact that I cannot list them all in here and cannot recommend acceptance of this manuscript. I fear that even a major revision round would not be sufficient to raise the quality of the submitted manuscript to a standard sufficient to warrant publication in the special issue of Solid Earth. The main issue with this manuscript is the complete lack of clarity as to the objectives of the research effort. This rflects in turn into a poorly organised manuscript that I cannot follow and often understand. I am not familiar with the local geology and refrain therefore from any comments pertaining that side of the study. Unfortunately, I believe that my concerns are so fundamental that

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there is no need at this stage to discuss the regional implications of this study. The authors have obviously studied a set of spectacular structures. Their efforts, though, target a plethora of scientific issues that are not conceptually linked and that remain frustratingly unrelated. A a result, the reader is left confused and frustrated and struggles to follow the text and understand what is discussed therein. A given shear zone from Calabria is studied from a meso- and microstructural perspective. The ductile evolution is touched upon in a rather confused fashion, without systematic descriptions and, worse to me, without a systematic approach backed up by a well-defined set of goals. I could not see what the authors wanted to really do. Is this a kinematic study? Is it a microstructural investigation? Are the results aimed at solving a geodynamic puzzle or are the observations instead meant to address fundamental processes linked to deformation mechanisms active under greenschist facies conditions? Is the fabric analysis section the focus of the work or is it instead the paleopiezometry? How does all of this fit into the attempt to integrate way too many "ingredients" into a coherent tectonic reconstruction or deformational scheme? Why focus on so many different aspects of the ductile history all at once? This remains all very obscure to me and does not help to understand the shear zone, its evolution and the implications thereof. And, unfortunately, I fear that the situation is made worse by the attempt to bring into the story also the brittle structural evolution of the region. A confused and poorly documented analysis of brittle structural features is used to tell apart multiple phases of "late" deformation, wherein fault rocks and processes are mixed and confused. Fractures, joints, veins, hydrofractures, role of overpressure, pseudotachylytes, cataclasites and so on are mentioned, in part discussed and sorted, but without any solid information as to how, into a number of brittle episodes taken to represent the natural evolution of the aforementioned shear zone into the brittle regime during exhumation. No information on the temporal dimension of deformation is ever provided such that the reader cannot know why one phase pre- or post-dates another brittle episode.

The frustrating lack of a clear, non-repetitive description, analysis and interpretation of the mapped structures is complicated by a very badly written text. The authors

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need the help of a native speaker to fix the manuscript, its language and the way it is structured. I have worked my way through the text and have provided plenty of suggestions in the annotated pdf uploaded with this review, but I had to stop after a few pages because I do not think that that is my role as a reviewer. Unfortunately, though, the text is in place so convoluted and unstructured that I could not really focus on the scientific component. My annotated pdf also contains plenty of scientific comments, questions and suggestions toward, hopefully, an improved version.

In fact, I wish I could be more positive about this manuscript. I wish so because there are indeed truly spectacular structures presented in here and I would love to be able to learn more about how they formed and what they can teach us.

To conclude, I would invite the authors to select one and one aspect only of their study and to build a completely new manuscript around that. I see no point in wanting to cover the entire deformational history of the shear zone. The viscous history, for example, when placed in an appropriate kinematic and geometric framework defined by the local and regional constraints, offers indeed enough material for in depth studies of the deformation mechanisms that were active and offers outstanding possibilities toward a sharp, process-oriented study or an important regional geodynamic investigation. The brittle history has obviously much to offer on its own, but I cannot see why it needs to be linked to the ductile history of the shear zone.

Please also note the supplement to this comment:
http://www.solid-earth-discuss.net/7/C315/2015/sed-7-C315-2015-supplement.pdf

Interactive comment on Solid Earth Discuss., 7, 909, 2015.