Solid Earth Discussions

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Comment on se-2021-87 - Anonymous Reviewer #2

Anonymous Referee #2

Referee comment on "A Normal Faults System in the Monte Nerone area and its significance in the recent seismo-tectonic setting of the Northern Umbria-Marche Apennines (Italy)" by Mauro De Donatis et al., Solid Earth Discuss., https://doi.org/10.5194/se-2021-87-RC2, 2021

General comments

In this work, the Authors attempt to provide evidence of active tectonics along surveyed normal faults in central Apennines (Mt Nerone sector, Umbria-Marche regions) by gathering information from different approaches (i.e., field survey, geomorphology, drone surveys, and 'remote' analysis of digital mapping). They integrate and compare the collected evidence with available geophysical data providing a re-interpretation of previously published seismic line and carrying on seismological analysis. They advance the possible association of the surveyed normal faults with recent seismicity as well as with one of the most energetic historical earthquakes that occurred in the sector, the 1781 Cagli (Mw 6.5), thus in the extensional seismotectonic setting of the central Apennines

The work addresses the interesting scientific question related to the possible activation of normal faults (hidden or not) eastward of the well-known Late Quaternary active extensional belt. The multidisciplinary methodology applied presents interesting potentiality to address the scientific problem in a sector (easterly of the Apenninic topographic high) where other 'subtle' evidence of active tectonics has been provided in the literature (e.g., *Ciaccio et al., 2005, doi:10.1016/j.tecto.2005.05.027; Valoroso et al., 2017, doi.org/10.1002/2017JB014607*).

Nevertheless, in reading the manuscript, I had regrettably to raise major concerns which I summarize mainly in a lack of robust data in supporting the Authors' interpretations and conclusions. This aspect combines with a quite surficial dissertation of the scientific problems (relevant to the paper's topic) that are generically introduced and not adequately presented and investigated.

Technical comments mainly relate to Figures which are not exhaustive and helpful to point

out the evidence of fault activity in the Late Quaternary. The language is not fluent and adequate for publication standards.

For these reasons, and notwithstanding the scientific question addressed by the work would be within the scope of SE, the manuscript is not ready for publication in its present form. I thus recommend major revisions before re-submission.

In the following, I detailed more specific comments and suggestions the Author may want to consider for the revision process.

Specific comments

- The Abstract should be re-written in a way to provide a concise summary of the paper's aims and a quick, but effective, preview of the results.
- In the manuscript, starting from the section 'Introduction', both the Cagli 1781 earthquake and the recent seismicity that occurred in central Italy (l'Aquila 2009, Norcia 2016) are mentioned to motivate the study. Nevertheless, the study area is not adequately framed in the seismotectonic setting the sequences belong to, in a way that is difficult (for readers who are not familiar with the sector) to understand where the study area locates with respect to the main extensional alignment as well as to the mentioned sequences. Since the aim of the work is to understand the 'significance of a normal fault system in the recent seismotectonic setting of the Northern Umbria-Marche Apennines', I would suggest adding a paragraph (with related figure) reporting all information on available seismicity (historical and instrumental) as well as a general introduction on the seismogenic structures known for the area;
- In the section 'Tectonic Setting' the Authors should provide a more detailed description of the extensional framework, which the study area is located within, avoiding confusion between the seismicity related to the east-dipping low-angle Alto-Tiberina fault (ATF) and that related to the west-dipping fault system.
- Evidence of fault activity in the field is weak. This could be partly compensated for providing some spots on the knickpoints the Authors discuss in the text, for instance by showing longitudinal profiles or some pictures. The absence of evident offsetting in the Quaternary deposits and/or of a well-developed basin (at the faults' hanging wall) might also account for incipient (young) faulting. Nevertheless, this absence could be overcome by showing at least an evident correlation with seismicity at depth. Unfortunately, the cross-section shown in the paper (Figure 10a) does not discriminate the seismicity located along the AFT from that possibly related (at depth) to the normal faults surveyed on the south-western slope of Mt Nerone. In addition, the section in Figure 10b seems more supportive of seismic activity nucleated along east-dipping fault planes than along west-dipping ones. I would also suggest providing and discussing a possible explanation on the evidence that the wide macroseismic field of the Cagli 1781 earthquake is completely located at the footwall of the fault system the Authors present in the paper, as well as to take into account of empirical relationship (e.g., *Wells and Coppersmith, 1994, Bulletin of the Seismological Society of America, 84 (4): 974–1002*) in testing the coherence between the fault system geometry (length, offset) with the Cagli earthquake's magnitude. A discussion of the interpretation provided by the Authors in comparison with different ones concerning the 1781 causative fault

(e.g., compressional fault as in DISS *Working Group, 2018, doi:10.6092/INGV.IT-DISS3.2.1*) is strongly suggested.

- In general, more emphasis should be provided to novel data, making clearer the new outcomes presented in this work from those deriving from the literature (even with respect to De Donatis et al., 2020).
- English language is poor and requires improvements sometimes even in the technical terminology.

Most of these comments and minor (**technical**) ones are also annotated in the pdf I have enclosed for this discussion.

Please also note the supplement to this comment:
https://se.copernicus.org/preprints/se-2021-87/se-2021-87-RC2-supplement.pdf