

Solid Earth Discuss., author comment AC4
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Reply on EC4

Paolo Boncio et al.

Author comment on "Late Quaternary faulting in the southern Matese (Italy): implications for earthquake potential and slip rate variability in the southern Apennines" by Paolo Boncio et al., Solid Earth Discuss., <https://doi.org/10.5194/se-2021-73-AC4>, 2021

Dear Editor,

Thank you for your work and for comments.

The work after the comments by Reviewers was really stimulating. In fact, we received:

- comments from a Referee who read the paper from the perspective of a "sceptical reader" (I quote his own definition) (Rev. 1);
- comments from a Referee who appears to disagree with most of our data and conclusions (Rev. 2); and
- encouraging comments from a Referee who judged our data excellent and our interpretation convincing (Rev. 3).

We studied in detail all the revisions, and we carefully considered all the comments, criticisms and suggestions.

In general, we are happy to accept all the constructive comments, from all the Reviewers. In detail (please, see the point by point replies):

- we agree in accepting almost all the suggestions from Reviewer 1, with few explained exceptions;
- concerning Reviewer 2, we are ready to improve the manuscript following constructive suggestions. Some criticisms have been rebutted on the basis of explained motivations and data. Other criticisms are judged unacceptable (replies n. 6 and 31), because unmotivated, or possibly due to misunderstanding of our writing and figures;
- we agree in accepting all the suggestions from Reviewer 3.

After this work, we are even more convinced of our data and interpretations. But, we acknowledge that the manuscript can be improved with a better organization and deeper discussion, particularly on fault activity, activity rate, throw rate variability, and comparison with other, previously published papers.

From the point by point reply to the Reviewers comments, you can realize that we have produced additional material (Figures A, B and C) aimed at improving the clarity of the paper, and strengthen some conclusions. We planned to add this additional material as Supplementary material. We are also planning a new supplementary section, containing further information on tephra useful for the time constraints of the identified units.

Finally, we would like to highlight that our contribution is primarily from detailed field work. As for any field work, the reader should have a minimum of trust that our findings are genuine. It appears to us that some comments are driven by scepticism on our field observations. Without a minimum of trust, everything is potentially questionable, and only the site by site field check can solve scepticism, which is not feasible, of course.

Concerning comments on geological map and sections in Plate S1 (see, e.g., replies n. 38 and following to comments by Reviewer 2), we think that geologic maps and sections are always a combination of: 1) firm constraints (outcrops); 2) geometric reconstructions according to stratimetric rules and structural geology; and 3) reasonable interpretations. In the map and sections proposed as supplementary material, we did our best on the basis of months of field work and reasoning. Certainly they can be improved. But we are sure to have done the best with a scientific approach.

We are happy to modify and improve map and sections, if they conflict with documented field constraints, or if there are errors, geometrical problems, inconsistencies. But, if the asked modifications are merely aimed at proposing alternative interpretations, without constraints, we need to be free of rejecting them.

To conclude, we would like to highlight that our work has several original strong points:

- this is the first time that the fault is mapped with such a detail. Previous papers did not go into this detail of fault mapping. Without such a detail, we never could discover fundamental evidence of recent faulting;
- this is the first time that faulted sediments are clearly documented and dated. For "critical" faulted sediments, we combined different types of analyses, in order to have strong results (e.g., ¹⁴C dating and geochemical analysis of the faulted paleosol in Fig. 9);
- this is the first time that the entire Southern Matese Fault system is mapped distinguishing different fault sections on the basis of their fault trace certainty and different constraints about the chronology of fault activity (i.e., Fig. 12). This type of detail is more and more requested by hazard modellers who use fault data for seismic hazard assessments (see e.g., a recent contribution by Scotti et al., 2021 in *Frontiers in Earth Sciences*);
- this is the first time that several punctual data of throw rate and uncertainties, and their spatial distribution along-strike the fault system are provided. Again, these are very critical and requested data from modellers. Because, together with geometric details of fault traces, along-strike variations of slip rates help modellers in exploring different segmentation models and rupture scenarios;
- we are strongly convinced that our results will improve our understanding on the seismic hazard that we should expect in Southern Apennines.

If you judge our response and the point by point replies to Reviewers adequate, we are ready to work on the manuscript and complete the revision.

Best Regards,

Paolo Boncio on behalf of all co-authors.