

Chieti, November 13, 2021

Dear Editor,

Attached please find the revised version of the manuscript entitled “*Structural complexities and tectonic barriers controlling recent seismic activity in the Pollino area (Calabria-Lucania, Southern Italy) - constraints from stress inversion and 3D fault model building*, by Daniele Cirillo, Cristina Totaro, Giusy Lavecchia, Barbara Orecchio, Rita de Nardis, Debora Presti, Federica Ferrarini, Simone Bello and Francesco Brozzetti, submitted for consideration to the journal “Solid Earth”.

The comments and suggestions we received from the two referees were very helpful. We accepted the hints aimed at improving the paper and we did our best to properly modify the manuscript in order to follow them.

All the major changes and new parts of the manuscript are indicated in the response letter and in the attached tracked version of the revised manuscript, in which all the added and/or modified sentences appear in red.

The organization of the text and the English language were carefully reviewed and edited.

We trust we have answered properly the reviewers’ remarks and that the revised manuscript is now suitable for publication in the journal Solid Earth.

Best regards,

PhD Daniele Cirillo

Dear Editor of the journal "Solid Earth"

During our revision process, we shared most of the reviewers' comments so, basically, we accepted all their requests for revision and did our best to improve the quality of the manuscript.

To allow a check of the additional work that we have made, in this letter we have replied to the major points raised by the Reviewers (reported in red) and listed the main changes to the text.

All the changes we have made are shown in the tracked manuscript.

Replies to REV1 Comments

1 - "the manuscript is highly fragmented, and the unified scientific overall story and implication are quite weak"

We have made an effort to comply with the reviewer's request and in particular:

- we have better explained in the "Introduction" section the scopes of our work and the workflow, highlighting the connections among its various parts. In particular, we have better integrated the structural constraints deriving from the surface data with those coming from the seismology. We have better defined the role of the geological and seismological tensorial analysis, and better integrated it with the field and seismological data. We believe that it is important to show the consistency between the stress fields obtained from both the datasets (structural data and earthquake focal mechanisms), and to confirm the good agreement between the quaternary extensional deformations surveyed at the surface and the coseismic deformations recorded in the area;
- to further improve understanding of the "scientific story" the description of the seismological data has been moved immediately after the description of geological data and before discussing the inversion of the stress field, which uses both geological and seismological data;
- for the same reason as above, we moved figures 2 and 3 (geological data and focal pseudo-mechanisms) to the section "Structural survey and fault kinematic analysis";

2 - "there are lots of inconsistent explanations with different scales that are hard to understand quantitatively"

In the revised text, we met this request by reorganizing significantly and partially re-writing, the "Data and Methods" and the "Discussion" sections.

We also better explained the relationships occurring between the different sets of active faults depicted in the 3D structural model, and the 2010-2014 seismicity, to make the subsurface reconstruction of the seismogenic structures more convincing.

We have also illustrated more in-depth the parameterization of the active faults and clarified some important features, as f.i. the "seismogenic patches" that ruptured during the seismic sequence. We stressed the reasoning that the comparison between the expected magnitude (obtained from the surface fault parameters) with the estimates of the values (based on the size of the seismogenic patch) could have great importance to ascertain the future seismogenic potential of the seismogenic structures.

The time-space relationships between the fault system activated by the recent seismicity and the Pollino fault, which has a long tectonic history and shows a very different strike, have been better described to hypothesize the role of tectonic-barrier played by this latter fault in the propagation of the coseismic ruptures.

3 - "I think if the following sections of abstract/introduction/discussions/conclusions are written more succinctly and significantly improved in order to let the reader get all the salient facts, and I would have no problem in recommending publication"

To comply with this request of Rev1 we have combined different chapters in just one, for a better comprehension of the text, and to improve the logical thread from different scales.

In particular, we combined the "3D Fault Model Building" section (which was previously included in the "Data and Methods") with the "3D Fault Model Building" chapter which was too methodological to be among the results. The respective figure follows the text.

In the "Results", however, remains "3D Fault Model of the Pollino area fault system" which contains results.

This change and other similar ones allowed us to significantly reduce the text (about 15-20%).

We added, in the supplementary material, the "Acronym list" for easier reading (suppl. Text 1)

Moreover, we have made an accurate revision of the English writing

Replies to REV2 Comments

1 - "The paper is in general well written even if a general reorganization of the paragraph is needed to follow better the text"

A very similar comment had been made by the REV1. we think we have answered in detail this point with replies 1 and 3 to REV1.

2 – "What I mean is to separate literature data from new results, and the latter from interpretation. For instance, I suggest to not include section 2.1 (Geological Setting) in section 2 but to separate them, and I invite the authors to continue with the same spirit"

As regards the Geological setting section, we made the requested change and separated it from the Seismotectonic Setting section.

Further, we reorganized the sections dealing with the structural-geological data and the seismological ones, and only after describing both of them, we present the tensor analysis to compare the Geological and seismological stress fields.

in general, in the new reorganization of the manuscript we have been particularly careful to separate the previous literature data, the results of our original elaborations from the interpretations and speculative considerations

Other significant revisions that meet this request of REV2, are those explained in our previous reply to point 3 of REV1

3 – the number of sections should be reduced, and a review of English is necessary.

Overall, we could not reduce the number of sections but thanks to the significant reorganization of the text and the careful revision, also of the English language, it was possible to sensibly reduce its length (see also reply to point 3 of REV1)