

Comments to the manuscript:

Title: Palaeoseismic crisis in the Galera Fault (S Spain). Consequences in Bronze Age settlements?

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The manuscript represents a valid contribution to the seismic hazard assessment of the Central Betic Cordillera, an area dominated by “slow faults” with long recurrence intervals. Through the excavation and analysis of some paleoseismological trenches the Authors provide original data for the active oblique Galera Fault, within a highly populated area where the record of prehistoric earthquakes is very scarce, addressing relevant scientific questions that are appropriate for Solid Earth and of broad interest among the Earth science community.

The integration of various analysis methods is certainly very appreciable and cutting-edge. Starting from the paleoseismological analysis of the terrain, in fact, a study path is developed in a balanced way which includes: i) Bayesian analysis to model the surface rupturing history for the Galera Fault; ii) recurrence intervals evaluation; iii) temporal fault behavior vs. EQs clustering; iv) fault parameters calculation and geodetic rupture scenario; up to the archaeological application of the results, v) Impact of palaeoearthquake clustering on Bronze Age human societies.

GENERAL COMMENTS

However, I think there are two main comments that the Authors should address to make the manuscript suitable for publication. The first criticism is aimed at the completeness in the presentation of geological data (in geological maps, cross sections, photos..), while the second concerns the method used in paleoseismological study.

1a) The first criticism is that in the manuscript (especially in sections 2 and 3) there is a strong deficiency and/or inaccuracy in the presentation of the basic geological-structural elements, both at the regional and mesoscale scales, which are fundamental for the reader to understand the geological structure and the seismotectonic context in which the study was carried out. I am referring in particular to the presentation of the geological data in the figures, which should summarize and clarify what is expressed in the text. However, many of the figures showing the geological aspects (e.g. figs 2,3, 4, 6) are incomplete and/or imprecise, as explained in detail in the "specific comments" section relating to the figures.

1b) I don't think it's just my convinced opinion that studies of paleoseismological trenches must always show, in addition to trench logs and interpretative schemes, orthophotos of the trench walls, at least for the sectors of greatest interest (e.g. fault zones). This does not mean lack of confidence in the interpretation work done, but has the fundamental meaning of sharing geological data with other researchers. This aspect is even more true for paleoseismological trenches where the studied outcrops (from tens to hundreds of cubic meters of geological record) will be lost to future researchers.

2) I believe the Authors must clarify why in a structural context characterized by an oblique kinematic fault with a prevalent strike-slip component (based on the geological and geodetic studies as reported in the manuscript by the authors themselves), trenches have not also been dug parallel to the strike of the fault. As the Authors know, the orientation of the trench is dictated by the inferred sense of fault displacement. For oblique and strike-slip faults, therefore, it is common practice to perform parallel trenching in order to define the "real displacement" by the offset of piercing points, while *"fault perpendicular trenches are often used to locate and define the width of strike-slip slip fault zones"* (McCalpin, 1992). I believe that carrying out statistical analyzes on slip-rates evaluated mainly on "dip-separation" data in trenches perpendicular to the fault may offers some problems, also due to the very small extent of the displacements that are measured, for the majority of cases in even very narrow Holocene time intervals.

I believe that the Authors must convincingly discuss these aspects.

SPECIFIC COMMENTS

Figures:

Fig. 1 - A clearer kinematic picture should be provided in this figure, indicating (with dashes, arrows...) at least the faults with normal kinematics and those with prevalent strike-slip kinematics.

- Indicate the Betic Cordillera with an acronym or other symbol. The Padul Fault and the Ventas de Zafarraya Fault referred to in the text in Fig. 1, are missing in Fig. 1.

Fig. 2 – Fig.2 is indicated in the caption as a Geological map. I find the legend in which only the ages are reported to be at least incomplete; in a geological map before the age the geological unit should be defined by distinguishing at least what type of deposits they are (fluvial, alluvial, lacustrine... and where possible lithofacies and the range of thickness).

-Does glacia surface mean a glacia of erosion or accumulation of deposits?

-Insert kinematic indicators for the GF

-Furthermore, the symbol in the legend for "towns" is not the one shown in the figure.

Fig. 3 – 2(a) same as fig. 2 (fix the legend: e.g. what do black point-dashed line and dashed black line-double point indicate? Distinguish geomorphological from geological features.... In Fig 3(c) the fault or fault zone crossed by trace I-I' (and from the trenches) is not represented in the geological cross section. In the latter it is clear that the geomorphological feature "Surface 1" is associated with the sedimentary body colored in green which is not indicated either in the map of Fig. 3a or in the caption.

Fig. 4 – The trenches in this figure are indicated as trench A and trench B, while in the text and in Fig. 2(b) they are referred to as trench 1, trench 2 and trench 3. Uniform and perhaps put the same acronym also along the cross section of fig. 3(c).

- In the wall of Las Acacias Gully in Fig. 3(b) it is clearly shown how the GF has lowered the fluvial terrace in its southern block (as also indicated by the red arrow), while in Fig. 4(a) it seems that the block lowered is the one towards the north. Clarify these kinematic aspects of the fault well.

- the acronyms of the samples next to the logs of the geological units are difficult to read.

- Bedrock instead of Bed Rock

Fig. 6 – For Fig. 6(a) and fig. 6(c) I suggest the same recommendations as in fig. 3(a) and 3(c).

- While I would suggest changing the name of the profile trace which for Fig. 3 and Fig. 6 is always I-I'.

Text (L=line)

L76 – Guadix-Basa Basin: what kind of basin is it? Extensional basin? Pull apart basin?

L96 – Specify from which type of studies “more than 2000 m of sediments accumulation” were estimated, geological, geophysical...?

L110 – Transfer to what? It is not clear from the figures and the text on which structure(s) the GF transfers the deformation towards the east.

L141 – Where is the sedimentary record associated with tectonic subsidence? Explain why under 5 m of fluvial deposits the lacustrine deposit of approximately 2.5 Ma is found directly at both the roof and the fault bed; this places constraints on tectonic subsidence associated with fault activity and its relationship with the extent of pre-Holocene erosion.

L187 – On what basis is it established that F2 is the fault that “presents the largest offset”?

L392 – In this way, however, do you exclude the hypothesis that the source could have been different?

L457-459 – It should be remembered that the liquefaction may be due to events on other nearby sources... (perhaps a check should be made with paleoseismological data on other nearby sources).

DETAILED COMMENTS

L114 – Where is the pull-apart in fig. 1? Indicate in fig.1... or perhaps better in fig.2

L120 – mbLg (specify the type of magnitude, at least the name... considering the multidisciplinary nature of the journal... it must be aimed at a broad audience)

L123 – insert a reference about who proposed the GF as the seismogenic source of the 1973 Huéscar EQ..

L128 – It should be Section “3”, not “2”

L586-857 - References - Several references cited in the text do not appear in the bibliography (e.g., line 97 Vera et al., 1994; and other inaccuracies which must be resolved as well.

You should feel free to use my comments as they feel appropriate. I hope they are useful. Thank you for considering me as a reviewer for this manuscript.

Very Truly Yours