Dear Referee#1 thank you for your comments and suggestions as they helped us to improve the manuscript and clarify some important aspects. In the following pages we address the concerns raised in your review and try to answer them accordingly.

1) **In the revised version of the manuscript, the authors have corrected numerous typographical errors and inconsistencies. However, it remains challenging for both the reviewer and potential readers to assess the accuracy of the calculations and results presented. Notably, data from the catalog used for the territory south and southeast of Spain is not readily available in the public domain.**
For the Italian catalog, even a superficial assessment of the data presented by the authors reveals discrepancies between the seismic parameters reported in the article and those in the HORUS catalog (https://horus.bo.ingv.it/). For instance, data about the test event in L'Aquila (Table 2) do not match the corresponding entry in the HORUS catalog.

Name	Latitude(ºN)	Longitude(ºE)	Depth (km)	Mw
L'Aquila (former)	42.334	13.334	10	6.1
L'Aquila (HORUS)	42.342	13.380	8.3	6.29

«255 It has a total of 49112 events with maximum depth of 30 km and maximum magnitude of 6.1 Mw».
In the HORUS catalog, from 1960 to 2012, there are 99,266 events with depths ranging from 0 to 100 km. The strongest event in the zone selected for analysis is the Irpinia earthquake on November 23, 1980, which has a magnitude of 6.81 according to the HORUS catalog.
The discrepancy raises concerns about the reliability of other data and calculations presented in the manuscript.
Given these issues, the reviewer recommends a thorough revision of the source data and calculations. The manuscript should be significantly reworked, with an emphasis on ensuring that the results can be reproduced and evaluated by interested readers for validity and

accuracy. This would not only enhance the credibility of the study but also its utility to the scientific community.

Response:

We agree with the referee, the above-mentioned issue induces confusion about the data source. The case of the Table 2 regarding L'Aquila earthquake comes from a mistake, as the table contained at first (not anymore after this revision) a placeholder information about the earthquake obtained from a source different from the HORUS catalogue. This has been changed as all the information in tables should come from the same source used in the computation.

The following fields in Table 2 have been updated:

Name	Latitude(ºN)	Longitude(ºE)	Depth (km)	Mw
L'Aquila (AB)	42.342	13.38	8.3	6.29

The epicentral distance to L'Aquila remains unchanged as the values of longitude and latitude used for the computation of said parameter are the ones from the HORUS catalogue (which now appear in the table).

Table 5 has also been updated to show two decimals, in case there are such, for the Mw:

So, for Mula the Mw is now 5.86 instead of 5.9. The rest of the events only had at most 1 decimal place, so they remain unchanged.

Regarding the number of events that appear in the text, the second paragraph of the subsection 3.1.1 in the manuscript has been modified with the corresponding explanation:

"*Figure 4 shows the location of the area of study (a rectangle with longitudes from 11.39**4** to 15.3**91**º E and latitudes from 40.3**59** to 44.35**3**º N) and the tectonic zones and main faults **as defined by** Danciu et al. (2021) **to compute the European Seismic Hazard Map**. For this area, the Italian HORUS catalogue (Lolli et al., 2020) has been used as it has been homogenised and comprises events from 1960 to 20**23** **(in order to study this particular seismic series)**. **A spatial filtering process has been applied to the catalogue to extract the events within the above-mentioned***

area, so 49112 events with maximum depth of 30 km and maximum magnitude of 6.81 Mw remain.”

There were some rounding errors that affected the values of the specified bounding rectangle area that have been also corrected to reflect the maximum and minimum coordinates in the catalogue. The previous version of the manuscript contained these values “*11.392 to 15.372º E and latitudes from 40.374 to 44.354º N”*, whereas the new version contains these “*11.39**4** to 15.3**91**º E and latitudes from 40.3**59** to 44.35**3**º N”*. This difference could be either due to rounding error while using Python to compute these coordinates or a mistake writing the manuscript. In order to be coherent, the maximum and minimum values have been checked with those that appear in the HORUS catalogue. The magnitude range has also been revised, as the maximum magnitude is indeed 6.81 Mw from the Irpina earthquake. The year range of the catalogue has also been modified from 1960 to 2023 (the previous version stated 1960 to 2012 and was a mistake) as it is a description of the full catalogue for this area.

In this sense the catalogues for both locations have been uploaded in an online GitHub repository so they can be checked. It will also be added as either a supplementary material or a link inside the manuscript. URL: https://doi.org/10.5281/zenodo.13691624

“*Data availability. The catalogues used in this work can be found in the following repository: https://doi.org/10.5281/zenodo.13691624*”

Dear Professor Chan, thank you for your comments and questions as they help us to improve the manuscript. In the following pages, the questions and comments are addressed in an orderly manner.

1) **Figure 2: Could you clarify the meanings of the crosses in various colours?**

Response:

The events that belong to the same cluster have the same colour, as this colour is assigned using the cluster numerical ID field. Figure 2 caption has been modified to have a clearer explanation as the phrasing was confusing. In this later version it can be read as:

"*Figure 2. Example of cluster identification in South-eastern Spain. The cross markers represent events in the catalogue which belong to a cluster while the grey circles are the events not belonging to any cluster. All the cross markers with the same colour indicate they are in the same cluster. The fault traces are presented in red-coloured lines and the spatial grid cell's limits with green lines. A zoom in on Lorca's cluster is shown in the bottom right corner, where the events of the Lorca's series are plotted using purple circles, the size of which depends on the magnitude of the event. "*

2) **Regarding the Italy case study, multiple catalogs have been used, including HORUS (Line 256), EHSM20 (Figure 4 caption), and CPTI15 (Line 268). I recommend using a single catalog for consistency. If using multiple sources is necessary, please provide a justification for the selection of earthquake parameters from these diverse sources.**

We agree that this should be addressed. We want to clarify in the first place that only one catalogue has been used in the computations, that is, the HORUS catalogue (Lolli et al., 2020).

The reference ESHM20 (Figure 4 caption) is not related to the use of a different catalogue but to the seismic zonation proposed in the current European seismic Hazard Map and how they divide the region in zones with different tectonic values

(b-values). We changed some mentions in the manuscript to avoid misunderstandings:

"*Figure 4. The map shows the tectonic zones (green lines) in Central Italy with their acronyms and tectonic b-values as can be found in Danciu et al. (2021)* ~~*computed in the EHSM20 (Danciu et al., 2021)*~~*.*"

Line 254: "..... and the tectonic zones and main faults as defined by Danciu et al. (2021) to compute the European Seismic Hazard Map."

The reference CPTI15 (Line 268) was included to justify the smoothing value used for the spatial uncertainty of the epicentral location of the earthquakes in Italy since the HORUS catalogue has no information about the location uncertainty. The HORUS catalogue is a homogenized instrumental catalog based on the hypocentral location of earthquakes compiled from the Italian Seismological Instrumental and parametric Database (ISIDe) and therefore their spatial uncertainty can be deduced from Rovida et al. (2022).

Since the smoothing value (sigma) used in our computations and based on the location uncertainty aims to account for the physical variability in the location of the earthquakes, we have tested two models with different uncertainty values to showcase the variability in the results as a consequence of increasing or decreasing the uncertainty of the epicenter location. Additionally, the work from Scudero et al. (2021) gives insight on the variation of the horizontal error (ERH) in Italy as well as a range of mean values for different revision processes on the data (2.2, 3.3 and 13.1 km). This range seems coherent with the uncertainties inside CPTI15 catalogue (Rovida et al., 2022, 2020).

Therefore, a minimum value of 6 km, in agreement with the previous explanation, and a maximum value of 30 km following the work of Taroni et al. (2021) has been chosen to characterize our spatial uncertainty.

We have removed the reference to CPTI15 to avoid misunderstanding but kept the reference to Rovida et al. (2022).

We have modified the manuscript to reflect this process and the reasoning behind it to clarify it to the reader:

“In order to characterise the spatial uncertainty on the epicentral location, two different possibilities have been defined. A minimum value of 6 km, in agreement with the mean epicentral uncertainty during the last decades of the instrumental seismicity detected by the Italian Seismic Network (Scudero et al., 2021; Rovida et al., 2022) and a maximum value of 30 km following the work of Taroni et al. (2021).

New references:

Scudero, S., Marcocci, C. & D’Alessandro, A. Insights on the Italian Seismic Network from location uncertainties. J Seismol 25, 1061–1076 (2021). https://doi.org/10.1007/s10950-021-10011-6