FIRST REFEREE

First, we thank the Anonymous referee for their insightful comments and questions as they were helpful towards the clarification and improvement of the manuscript. In the following document their questions are addressed in the same order as they were presented in the referee's report.

1. **The point "few earthquakes are associated with specific fault segments and occurrence time periods (when indicated) are affected by high uncertainties " in the abstract is not quite clear explained in introduction. It is suggested to supplement relevant content.**

   This sentence is a slightly modified quote to Gaspar-Escribano et al. (2015) "… data quality is very heterogeneous; there is only a few earthquakes associate to specific fault segments; and recurrence periods (when indicated) contain strong uncertainties." in the context of using the QAFI database to define fault seismic sources. In order to avoid any confusion, the page of the paper where the citation can be found has been added to the citation: (Gaspar-Escribano et al. 2015, p. 67)

   This consideration, nevertheless, can be extrapolated to certain recurrence times for historical earthquakes, as their magnitude is computed by homogenization of the intensity value, which as a subjective scale yields great uncertainties, as stated by the previous authors in section 2 first paragraph, page 63, in the context of catalogue uncertainties.

   This is what motivated the authors to base the seismic hazard analysis in polygonal sources rather than fault sources.

   The following sentence has been added in the four-to-last paragraph of section 1 to clarify this point:

   "*It is important to state that the high uncertainties in the QAFI database (Garcia-Mayordomo et al., 2012) and lack of earthquakes related to certain fault segments as pointed out by Gaspar-Escribano et al. (2015, p. 67) rules out using a fault based seismic source model*."

2. **In section 3.1, Mc and b value is presented using Table 1 and Figure 5. These two contain a lot of duplicate information, it is recommended to merge. And the graphs and tables in the article are many, it is suggested to adjust appropriately and retain the more critical ones.**

   We agree with the referee in this regard. Since we wanted for the reader to be able to check the values, we presented the table as well, but in order to avoid duplicities we have modified figure 5 so it also shows the values next to each marker in the graph. This way these values can be easily compared with other works.

New version of Figure 5 to be used so Table 1 is redundant:

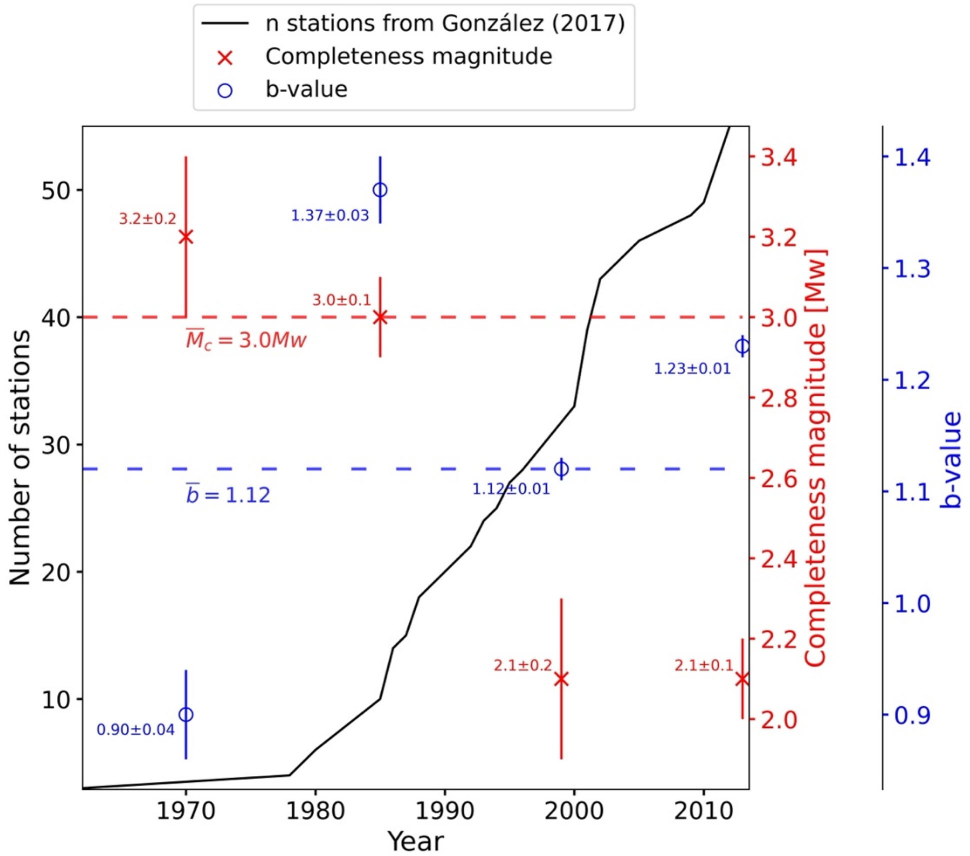

Figure 5. Changes in the b-value and completeness magnitude over time along with the evolution in the number of seismic stations near the area of study for the period 1970-2014. The markers represent the values of the b-value (blue) and completeness magnitude (red) from the year in which they are plotted to the next marker's year location. For example, the first marker would be the b-value (completeness magnitude) from 1970 to 1984. The dashed lines indicate the values of the parameters for the whole catalogue (1970-2023).

3. **From Table 2, it is observed that the two datasets exhibit a difference of 0.2 in the Mc value; however, there is a significant disparity in the number of recorded earthquakes. Are there any additional differences between the two earthquake catalogs that could account for this variation?**

In both cases the original catalogue is the same, the difference between the two datasets appears when the filtering is applied for completeness magnitude Mw3.0 and Mw3.2.

In the following table we present the size of the catalogue depending on the completeness magnitude for the area of study.

Completeness magnitude	Total number of events in the catalogue
3.0	3191
3.2	1806

This analysis can be extrapolated to lower magnitudes:

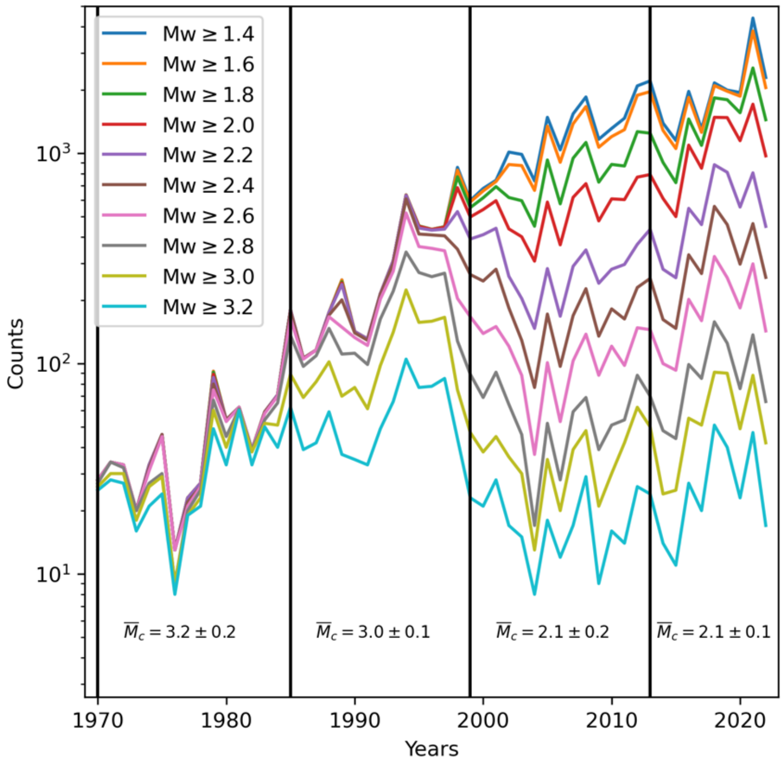

Figure. Cumulative number of earthquakes per year, for different moment magnitude thresholds. The black vertical lines indicate the times of completeness magnitude changes.

This behaviour is not exclusive of the Mw3.0-Mw3.2 bin, it can be seen in other bins as well. This tendency could be related to the seismicity in the area (periods of more seismic activity in the regions, for example during 1990). Another important factor could be the inequal development of the seismic network, which causes heterogeneity in the completeness magnitude (meaning there is an excess in a magnitude bin in the energy-frequency histogram due to detection limits). This can be also seen in Figure 5 where the number of stations almost doubles from 1990s to 2000s.

1. **In Section 4.1, the metrics of outdegree centralization, closeness centralization, and average leaf depth are utilized**

to assess the characteristics of clusters. Additionally, various types of seismicity are mentioned, including burst-like, swarm-like, chain-like, and umbrella-like phenomena. It is recommended to unify these terms, as some possess similar meanings, to enhance clarity and coherence. Furthermore, a more detailed explanation of the specific characteristics of each cluster type would provide a deeper understanding of the underlying seismic activities.

We agree with the referee that adding more context to the explanation could benefit the manuscript. The terms umbrella-like/burst-like indeed refer to the same cluster structure, the same way chain-like/swarm-like do. From sections 4.2 on we prefer using the terms burst-like and swarm-like as they can be more easily related to the kind of cluster to be expected. Nevertheless, in the section 4.1 we present both naming options in order to explain the graph theory concepts as they can appear in several other papers.

In order to clarify what these terms mean we provided an additional figure and the interpretation of Figures 8 and 10 (for Adra Sequence and Granada swarm) using this classification.

"Figure 12 shows an example of such cluster structure types according to their tree graphs. In reality, more complex cluster structures are expected due to combination of these typologies. For instance, Adra's sequence (Figure 8) could be classified as a double-umbrella-like cluster whereas Granada's swarm (Figure 10) has a more pronounced chain-like component."

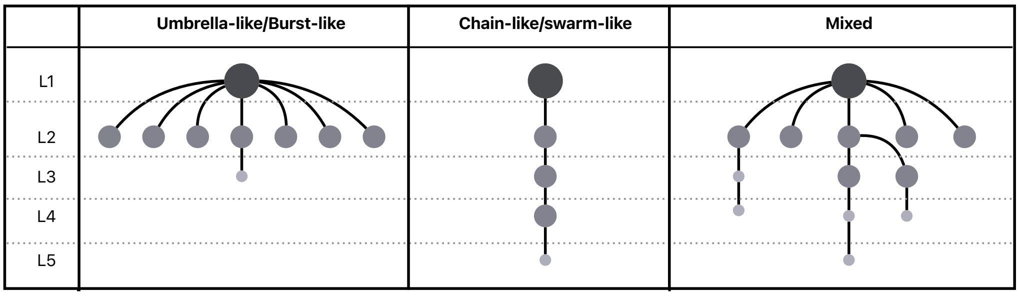

Figure 12. Cluster types according to their tree-graph structures. The events are represented with sizes and grey-shade colours according to their magnitude.

4. **Figure 3 presents the magnitude-depth distribution of seismic events. It would be interesting to further investigate whether the differences in seismic activity characteristics between tectonic regions can be better understood through a combined analysis of focal depths and focal mechanisms. This could be a direction for future research.**

We agree that the analysis of focal depth and mechanism can benefit both the understanding of the seismic activity behaviour in the different tectonic zones and help identifying and characterizing the seismic sources. This would require a re-evaluation of the focal depths in all the Spanish catalogue, as the uncertainty in this parameter has changed over time (as well as in the case of the epicentral location) and should be accounted for. For this task, a better knowledge on the fault planes is needed, as in such cases in which no clear solution for the focal depth is obtained, one could use the parameters in the fault plane and, through methods such as Monte-Carlo, simulate the most likely depth for the hypocentre.

With the combined information of both focal depths, focal mechanisms and cluster structures (and fault trace location and plane geometry), one possible direction of research could focus on analysing the evolution of the seismic series considering induced and auto-induced seismicity in complex faulting scenarios such as in the case of Granada.