

## REVIEWER #1

1. **Abstract: This study presents a methodology to constrain the sources of large earthquakes..."**  
Additionally, please mention the novelty of integrating residual analysis with outlier detection in the abstract.

*Reply: We thank the Reviewer for his/her suggestion. We have corrected the typo to the plural form ("large earthquakes") in the second sentence. Furthermore, as suggested, we have explicitly highlighted the novelty of our workflow by adding a dedicated sentence explaining the detection of intensity outliers through residual analysis based on an intensity prediction equation (IPE).*

2. **The literature review is extensive; however, it may benefit from a short paragraph emphasizing the limitations of existing approaches and how the proposed workflow addresses them.**

*Reply: Following the Reviewer's suggestion, we briefly specified the request in the Introduction of the revised manuscript (see lines 43-47).*

3. **Some long sentences could be simplified for better readability, particularly lines 50–65.**

*Reply: Following the Reviewer's comment, we revised the text in lines 50–65 by breaking long sentences and simplifying the sentence structure where appropriate.*

4. **The explanation of the pre-processing stage and outlier removal using the Gomez-Capera et al. (2024) IPE is scientifically sound.**

*Reply: Thank you for the comment.*

5. **The authors may consider discussing the sensitivity of the results to the selected  $3\sigma$  threshold for outlier identification**

*Reply: We specified in the text (see lines 107-110) the choice of the  $3\sigma$  criterion (2.25 intensity units) for the identification of intensity outliers. This value ensures the removal of extremely large outliers, without reducing the data set excessively.*

6. **The methodology would benefit from a small flowchart legend explaining abbreviations such as BE, RMSE, GOM20, and OLI22 for readers unfamiliar with the terminology**

*Reply: In the revised version of the methodological workflow (Figure 4), we have fully expanded the acronyms and explicitly defined the meaning of the abbreviations (GMM, GMICE, BE, RMSE, GOM20, and OLI22) directly within the figure text boxes and their captions to ensure maximum readability.*

7. **The choice of Wells and Coppersmith (1994) scaling relations is appropriate, but the limitations of applying these empirical relations to historical earthquakes could be briefly discussed.**

*Reply: We specified in the revised manuscript the limitations of applying these empirical relations to historical earthquakes (see lines 210–212).*

8. **The discussion of the 1990 Potenza earthquake clearly illustrates how outliers can bias epicentral estimation.**

*Reply: Thank you for the comment.*

**9. In Tables 3 and 5, it may help readers if the best-performing source configurations are highlighted using bold formatting in addition to the asterisk**

*Reply: Following the Reviewer's suggestion, we have highlighted in bold the best-performing source configurations in Tables 3, 5, and 7 to improve readability.*

**10. Some figure captions are very long and may be shortened for improved readability.**

*Reply: Following the Reviewer's comment, we have revised and shortened all the figure captions (Figures 2 to 8) as much as possible to improve readability. In addition, table captions were also edited to reduce redundancy and ensure a more concise and consistent presentation throughout the manuscript.*

**11. Increase font size in several figures (especially residual maps and legends), as some labels are difficult to read**

*Reply: We agree with the reviewer's comment, and we have revised all the figures to ensure better readability. Specifically, the font sizes of the labels, text, and map legends have been increased in Figures 2 to 8.*

**12. Table formatting could be improved slightly for better alignment of columns and readability**

*Reply: The table formatting has been revised by standardising the decimal precision of numerical values to improve visual consistency.*