

Author Response to the Second Referee (Dr. Jürgen Mey)

We sincerely thank Dr. Jürgen Mey for the thorough and constructive evaluation of our manuscript. We completely agree with your assessment that the previous version of the manuscript suffered from a mixed structure, where methodologies, results, and interpretations were intertwined. This structural issue indeed obscured the logical flow of our study. Following your major comment, we have undertaken a comprehensive restructuring of the entire manuscript. We have strictly separated the methodology, results, and discussion, and relocated background information to the Introduction. We believe this restructuring has significantly improved the clarity and readability of the paper.

Below, we detail our responses to your specific comments and describe the corresponding revisions made in the revised manuscript.

Major comments

The authors often mix methodological description, results and interpretation. I urge them to clearly define a methods and a results section and separate these from the interpretation/discussion. I also think that some text that is spread throughout several sections could be put into the introduction (see below). After these structural changes the work could be published.

RE: We deeply appreciate this crucial and overarching comment. We fully agree that mixing methods, results, and interpretations compromised the clarity of the narrative. To address this, we have completely reconstructed the framework of the manuscript into a standard and rigorous format: 1. Introduction, 2. Data Sources and Screening Sample Construction, 3. Methods, 4. Results, 5. Discussion, 6. Conclusions.

Specifically, we have made the following structural changes:

1. Text relocated to the Introduction: We moved the background information and literature reviews regarding RIS patterns in other countries (which were previously scattered in the old Sections 3 and 4, e.g., old L232-247 and L277-293) to the Introduction. This provides a more comprehensive background context before presenting our own work.
2. Methodology consolidated into the Methods section (Section 3): We extracted all methodological descriptions and formulas that were previously embedded within the results sections. This includes the normalization and W-score method (old Section 4), the sequence parameter calculation (OK1993 and ETAS models, old Section 5), and the correlation analysis formulas (old Section 6). These are now clearly defined in the new Section 3.
3. Results separated from interpretation (Section 4): The new Results section (Section 4) strictly presents our factual observations and statistical findings (e.g., the power-law decay of distance distribution, the statistical differences in sequence parameters, and the correlation coefficients) without interjecting physical interpretations.
4. Interpretation moved to the Discussion (Section 5): All physical interpretations, implications,

and mechanistic discussions have been removed from the data presentation and relocated to the new Discussion section. This includes the interpretation of pore pressure diffusion mechanisms (old L315-322, L325-339), the physical implications of distinct sequence parameters (old L431-433), and the mechanistic explanations for the weak correlations with Mmax (old L498-502).

We believe this rigorous restructuring fully addresses your concern and presents a much clearer scientific narrative.

Minor comments

1. L29: "Temporally, 95% of RIS events occur within 24.8 km of the reservoir shoreline..." suggest delete "Temporally".

RE: Thank you for pointing out this typo. We agree that "Temporally" was incorrect here. We have changed it to "In the near field" to accurately match the description of distance.

2. L30: Here and elsewhere in the ms you write terms with small letters and in again with capital letters (like here "time lag (Time Lag)"). I suggest you choose only one form and stick to it.

RE: We agree with the reviewer. We have unified the terminology throughout the manuscript by consistently using lowercase (e.g., "time lag", "reservoir capacity") unless they refer to specific variables in equations or figure labels, removing the redundant capitalized terms in parentheses.

3. L33: "distinct parameters" is too unspecific. Maybe better "distinct parameters of their frequency magnitude distribution".

RE: We agree. We have revised the text to "statistically distinct parameters of their frequency-magnitude distribution" to be more specific.

4. L67: "<5km" this is not an area but a distance.

RE: Thank you for the correction. We have changed "affected area" to "affected distance" to accurately reflect the spatial extent.

5. L72: define abbreviation PGA

RE: We have defined the abbreviation PGA as "Peak Ground Acceleration" at its first occurrence in the text.

6. L80: "...is a globally recognized typical RIS event" add reference

RE: We have added the relevant references (Talwani, 1997; Gupta, 2002) to support this statement.

7. L137: what is ML?

RE: We have defined ML as "local magnitude" at its first occurrence in Section 2.

8. L142-146: This sentence seems to be unlogic to me. Suggest rephrase.

RE: We agree that the original sentence was awkwardly constructed. We have rephrased it to clarify the logical relationship: "While dedicated seismic networks at individual reservoir sites

often provide more complete data with lower M_C , accessing such data uniformly across China is challenging. Therefore, this study utilizes the National Unified Official Earthquake Catalog, which offers the significant advantages of relatively consistent spatial coverage across China and a long-term record spanning over 50 years."

9. L213: What is "completeness magnitudes" is it a cut-off?

RE: Yes, M_C refers to the magnitude of completeness, which is used as the lower-bound cut-off in our analysis. We have clarified this in the text.

10. L232-247: This should go to the introduction

RE: We agree. This paragraph elaborates on the relationship between RIS and tectonic settings in other countries, which fits the context of the Introduction. We have moved this paragraph to the Introduction section.

11. L251: "Sichuan-Yunnan rhombic block" could you show this on the map, e.g. in Fig.2

RE: We have added the boundary of the Sichuan-Yunnan rhombic block to Figure 2a for better geographical reference.

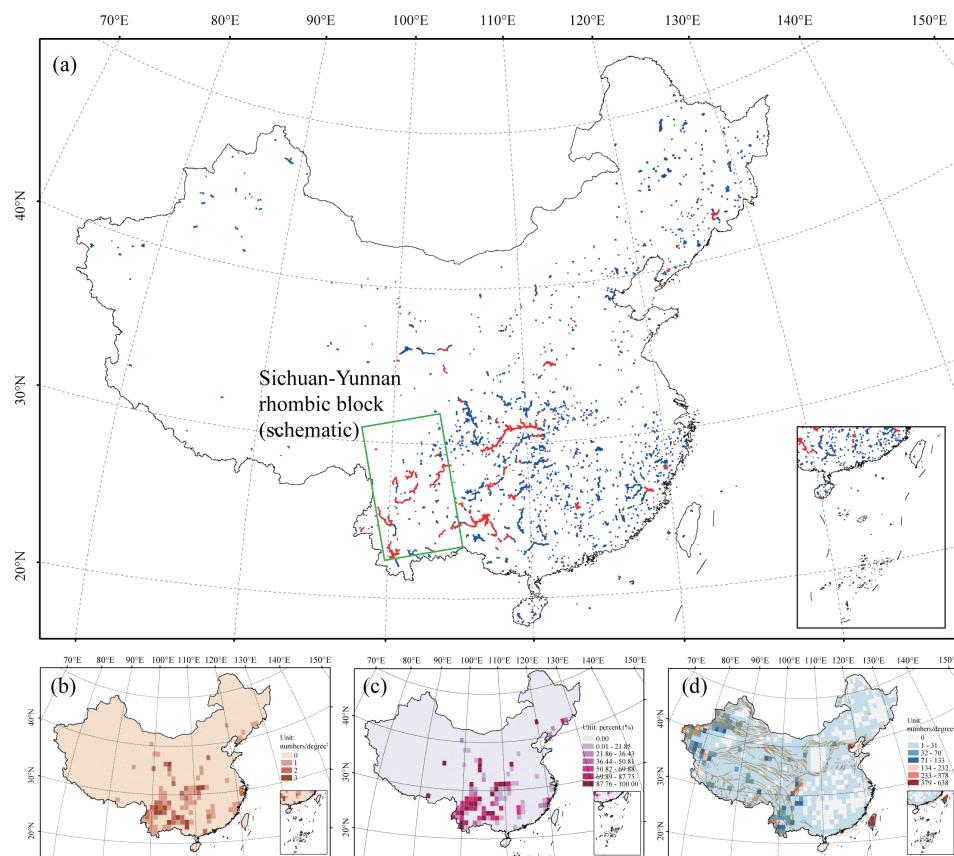


Figure 2. Spatial distribution characteristics of reservoir-induced seismicity in China. (a) Spatial distribution of large/medium-sized reservoirs and reservoirs with induced seismicity. Blue polygons represent large/medium-sized reservoirs (capacity $\geq 0.1 \times 10^8 \text{ m}^3$) with complete parameters (e.g., impoundment time, dam height); red polygons represent reservoirs with induced seismicity, identified based on spatiotemporal clustering. The green oblique box schematically outlines the approximate extent of the Sichuan-Yunnan rhombic block, highlighting the tectonic region where reservoir-induced earthquakes are predominantly concentrated. (b) Spatial density of

reservoirs with induced seismicity (units: number per square degree). (c) Spatial distribution of the proportion of reservoirs with induced seismicity among all large/medium-sized reservoirs. (d) Density distribution of $M \geq 4.0$ earthquakes in China (units: number per square degree) and mapped active faults (brown lines, Xu *et al.*, 2016). This threshold is chosen to illustrate the long-term regional tectonic setting and active fault framework, distinct from the $M_C = M_L 2.5$ catalog used for RIS sequence analysis.

12. L259-263: How was the mentioned comparison done and how was the significance in the spatial correlation determined?

RE: The comparison was primarily conducted through visual spatial overlay of the induced-type reservoirs with mapped active faults and earthquake density (Figure 2d). We have clarified in the text that this is a "visual spatial overlay comparison" and modified "significant spatial correlation" to "clear spatial consistency" to more accurately reflect the qualitative nature of this observation.

13. L266: suggest delete "intensity"

RE: We have deleted the word "int" as suggested.

14. L277-293: this entire paragraph should go to the introduction

RE: We agree. This paragraph reviews the empirical understanding of spatiotemporal patterns in other countries, which belongs in the Introduction. We have moved it to the Introduction section.

15. L294-305: Here you describe methods and right after that you continue with the results from L306-315, which in turn is followed by a discussion/interpretation from L315-L322.

RE: We agree with the reviewer's observation. In line with our major restructuring, we have clearly separated the methodological description (now in the Methods section), the results (now in the Results section), and the discussion/interpretation (now in the Discussion section).

16. L325-339: reads more like a discussion/interpretation

RE: We agree. This interpretative text has been moved to the Discussion section in the revised manuscript.

17. L341: "The potential contribution of early elastic loading, triggering very few near-field events..." how were these mechanisms (elastic loading vs. pore pressure) differentiated?

RE: The mechanisms were differentiated based on their characteristic time scales. Elastic loading causes an instantaneous response (hours to weeks), while pore pressure diffusion causes a delayed response (months to years). Since our data shows a delayed peak, we inferred that pore pressure diffusion dominates and the contribution of elastic loading is weak. We have added this explanation to the Discussion section.

18. L372-377: So you calculated the alpha, b and p values for the entire RIS dataset and then only the b values of individual reservoirs, right?

RE: Actually, we calculated the α -value, b -value, and p -value for individual RIS sequences (38 sequences met the criteria), not just the entire dataset. We then compared these individual sequence parameters with natural earthquake sequences. Separately, we compared the b -value of each RIS sequence with the background seismicity b -value. We have clarified in the Methods and

Results sections that the calculations were done for individual sequences.

19. Equation 4: please define all variables, i.e. λ , m , σ , x

RE: We apologize for the omission. We have added the definitions for all variables in Equation 4: " λ is the expected number of earthquakes, m is the magnitude, σ is the standard deviation of the normal distribution describing the detection capability, x is the integration variable, and μ is the magnitude at which the detection probability is 0.5."

20. L383: what is G-R relationship?

RE: We have defined the G-R relationship as the "Gutenberg-Richter relation" at its first occurrence.

21. Equation 5: define λ , isn't M_0 the same as the completeness magnitude M_L ?, the variable t was used before as time after impoundment, I suggest staying consistent and use something else for the time after the mainshock, e.g. t^*

RE: We have defined λ as the conditional intensity function. We clarified that M_0 is the cutoff magnitude, which is typically set equal to the completeness magnitude M_C . Furthermore, we have changed the variable for time after the mainshock to t^* to avoid confusion with the time since impoundment, as suggested.

22. L397-400: So most of the data (50 out of 88 cases) weren't actually used. How did you define the number of 40 earthquakes as being the threshold? Could you give more details about the parameter uncertainties? How were these determined?

RE: We defined the threshold of 40 earthquakes based on empirical experience from previous earthquake sequence parameter fitting studies (e.g., Bi *et al.*, 2022), which suggests that fewer than 40 events often lead to unstable parameter estimations. The parameter uncertainties (δb , δp , $\delta \alpha$) were determined as the standard errors derived from the maximum likelihood estimation. We have added these details to the Methods section.

23. L431-433: This belongs to the discussion.

RE: We agree. This sentence has been moved to the Discussion section in the revised manuscript.

24. L441: define abbreviation KS

RE: We have defined the abbreviation KS as "Kolmogorov-Smirnov" at its first occurrence in the Methods section.

25. L453-455: What do you mean by the "first strategy". Please be more specific.

RE: We have clarified this as a "non-overlapping concentric zoning strategy" to specify that the zones were discrete and independent from each other.

26. L498-502: This is interpretation.

RE: We agree. This interpretative text has been moved to the Discussion section.

27. L543: How was the significance of the spatial coupling determined?

RE: Similar to our response to Comment 12, this was determined through visual spatial overlay. We have changed "significant spatial coupling" to "clear spatial consistency" to reflect the qualitative nature of the observation.

28. L552: What do you mean by "normalized" ? I think "explained" would be a more suitable choice in this context.

RE: We agree. We have replaced "normalized" with "explained" as it is more suitable in this context.

29. L557-559: Where does this citation come from?

RE: We apologize for the missing citation. We added the relevant references (Lamontagne et al., 2018; Grasso et al., 2018; Barros et al., 2018) to support this global understanding.

30. L561-563: Could you qualify these statements more? How is the intraplate tectonic setting more complex? Is there any systematic work on the fault permeability in China in comparison to the other regions that you could cite here?

RE: We thank the reviewer for this insightful comment. We agree that stating "higher fault permeability" without systematic quantitative comparisons across regions is an overstatement. As the reviewer rightly pointed out, systematic work directly comparing fault permeability in China with other regions is currently scarce. Therefore, we have revised the text in the Discussion to remove this direct comparison and instead qualify the statement from both structural and observational perspectives.

First, to clarify how the tectonic setting is more complex, we specified that it is "characterized by intense crustal deformation and widely developed deep-seated strike-slip faults." These dense pre-existing fault networks provide the structural pathways for fluid migration. Second, rather than claiming higher permeability, we now state that the observed long-distance diffusion of pore pressure (up to 30-40 km, as detailed in our study) indicates that the hydraulic properties of these faults meet or exceed the threshold of "seismogenic permeability" required to trigger earthquakes (Talwani et al., 2007; Miao et al., 2025). We believe this revised logic is more rigorous and physically constrained.

31. Figures

Fig.1: ...I strongly suggest deleting all symbology from the legend that is not relevant for the map extent. What is meant by "Pickup frame"?

RE: We thank the reviewer for catching this confusing term. "Pickup frame" does not accurately convey its scientific meaning; the dashed irregular polygon represents the manually selected spatial extent delineating the identified induced earthquake sequence. We have replaced "Pickup frame" in the legend with the proper term "Spatial boundary of the induced sequence" to accurately reflect its meaning. We have also deleted irrelevant symbology from the legend as requested.

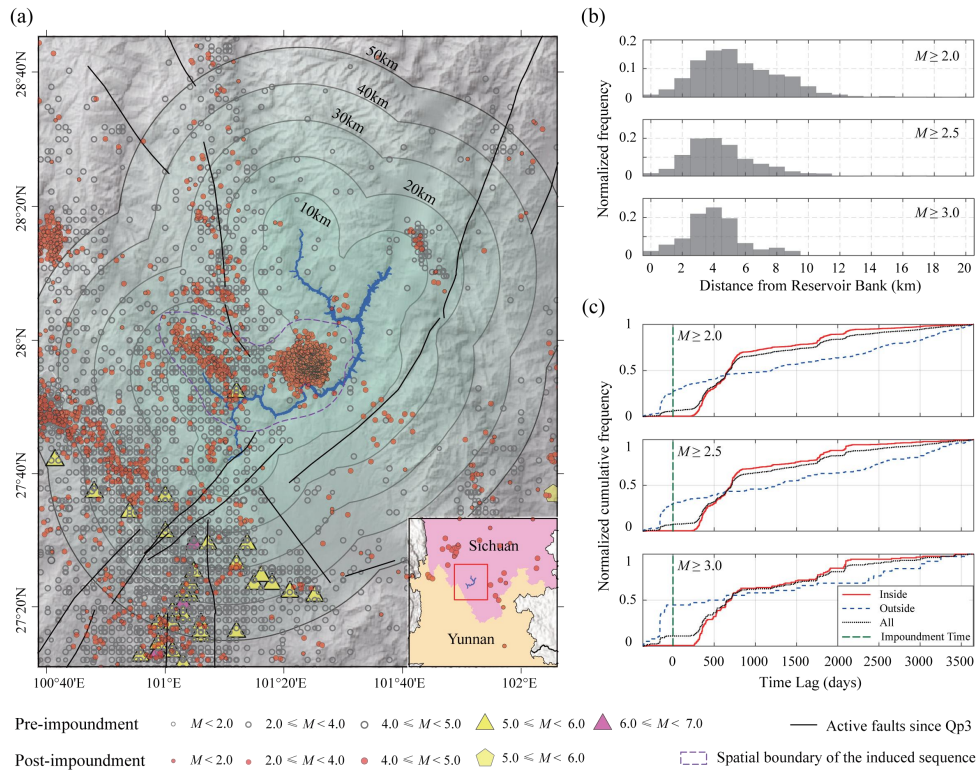


Figure 1.

Fig.2: Please add a reference to the work that mapped the faults shown in (d)

RE: We have added the reference for the mapped active faults shown in Figure 2d. The fault data is sourced from the "Seismotectonic Map in China and its Adjacent Regions (1:4 000 000)" compiled by Xu et al. (2016). We have updated the caption of Figure 2d to include this citation. The full reference has also been added to the reference list.

Fig.3: Your usage of completeness magnitude and cutoff magnitude are confusing. Couldn't you just use one of these terms? In panels c) and (d), the colorbar labels are missing.

RE: We thank the reviewer for pointing this out. We agree that the mixed usage of terms is confusing. We have corrected the text in the figures to "MC" to ensure consistency throughout the manuscript.

Regarding panels (c) and (d), the color fill indeed represents the probability of an earthquake being induced, as defined by the W-score model. We have added the label "induced probability" to the colorbars in both panels to clarify their meaning.

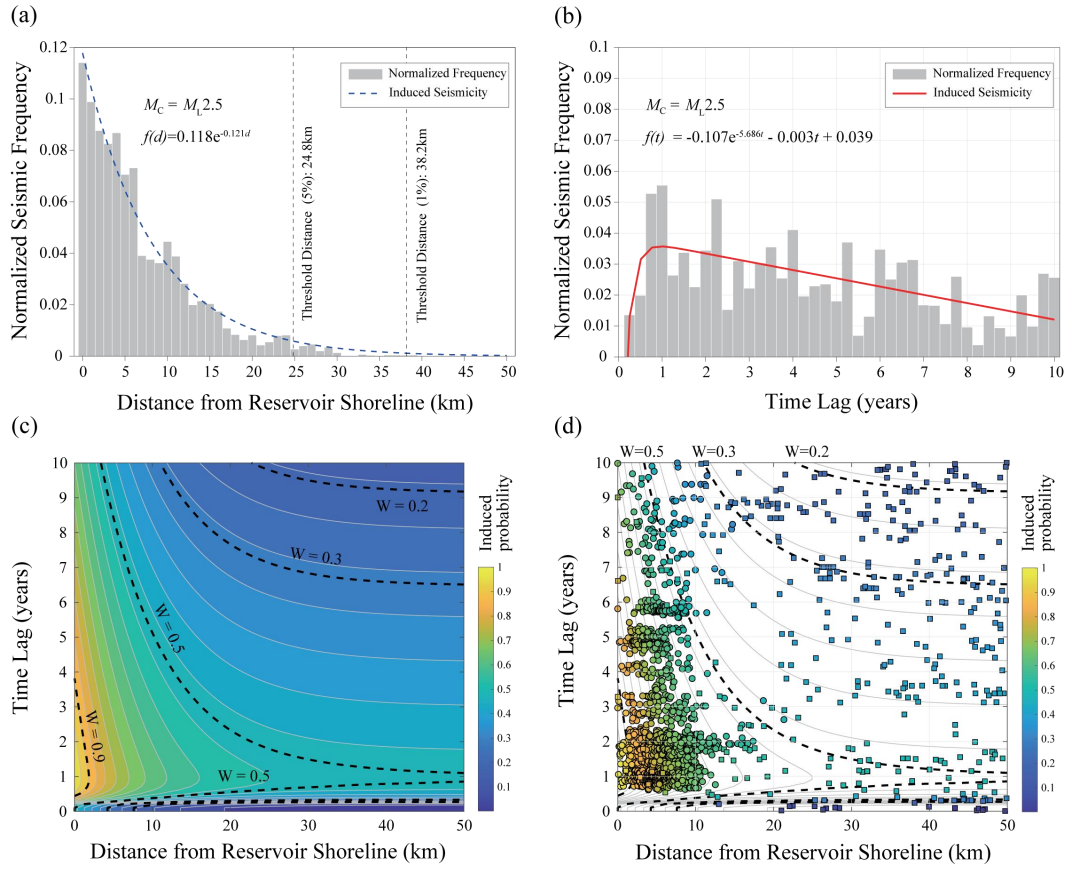


Figure 3.