REBUTTAL LETTER

Dear Editor,

Thank you for reviewing our manuscript. We have carefully reviewed all the reviewers' suggestions. We have addressed all these suggestions in the revised version of our manuscript. You will find in this rebuttal letter all reviewers' comments with our incorporated answers. We also include in this resubmission a revised version of our manuscript, as well as a revised manuscript with tracked changes.

We hope that, after addressing all the comments, you will now find this revised version of our manuscript suitable for publication.

P.S.: We include in this manuscript all and each of the reviewers comments (bold) as well as our answer to these comments. Additionally, we include in our answers the lines number where the changes mentioned can be found. These numbers are as follows: lines xxx-xxx/yyy-yyy. The first group of numbers refer to the clean new version of the manuscript, while the second group refers to the file that includes tacked changes. For instance, lines 664-705/742-813 means:

- 664-705 of the clean file

and

- 742-813 of the tracked-changes file

REVIEWER 1

S1-I suggest that the authors consider including the phrase "salt-influenced tectonic setting" in the title of the manuscript. This represents the main novel contribution of the work, along with the parameterization of the three active faults in the Valencia Trough.

We greatly appreciate this suggestion, as it will help clarify the scope of our work for readers. We revised the title as follows: Influence of salt-related mechanical layering on the seismic potential of active faults: insights from the southwestern Valencia Trough (Western Mediterranean)

S2-*Section 4. Stratigraphy.* I recommend reducing this section, as it does not represent the main objective of the work. Providing such a detailed stratigraphic description may distract the reader from the key focus of the study and could make the narrative less clear. A more concise summary would keep the manuscript streamlined and focused.

That is true. We thank Reviewer 1 for bringing this to our attention. Following the Reviewer-1 suggestion, we significantly reduced this section from 85 lines of text down to 57 lines (lines 235-291/235-318)

S3-Some figures and graphics are difficult to read, and I have included some recommendations into the attached pdf file. For instance, letters with a grey color, small numbers in the isopach lines, and similar colors I plots for the SR long-term estimation.

Once again, we appreciate Reviewer 1's recommendations regarding the overall arrangement of the figures. We followed her/his suggestions to improve the presentation of our figures.

S4- I have some major concerns regarding the comparison between the Valencia Trough and the Zagros Thrust and Belt based solely on the presence of a "mechanically weak layer." This comparison overlooks several tectonically significant parameters, starting with the fundamentally different tectonic settings: The Zagros is characterized by crustal shortening and active mountain building, whereas the Valencia Trough corresponds to a uniaxial extensional marine basin. In addition, isostatic processes are not considered, and the rupture mechanisms are inherently different. Reverse faulting in the Zagros involves the mobilization of very large rock volumes in the hanging wall, which is not directly comparable to normal faulting in a sedimentary marine basin. A more cautious discussion is required to avoid oversimplifying the analogies between these two geodynamically contrasting regions. Thermal coupling in different depth are also ignored.

S5- You have not demonstrated this claim (similarities between both tectonic settings, Valencia Trough and Zagros region). What is shown is only a convergence in the geometry of the spatial distribution of seismicity, but this does not constitute a "pattern" based on the underlying mechanical behavior of the faults. A true mechanical pattern would require evidence of consistent fault kinematics, stress distribution, and deformation mechanisms, which are not demonstrated in the current version of the manuscript. Please, consider to remove this part, I have no the relevance in your paper. This only distracts from the methodology that authors propose.

We understand Reviewer 1's concern regarding the analogy presented in our manuscript between the Valencia Trough and the Zagros Mountains. We are fully aware of the significant geodynamic differences between these two regions, as we have already acknowledged in the manuscript. Additionally, Reviewer 2 also expressed concerns about this comparison. The convergence of both reviewers' opinions suggests that our interpretation may have gone too far. Consequently, we agree with Reviewer 1 and believe it is best to remove this part from our manuscript.

A more relevant regional comparison might be found in central Italy, which has been undergoing extension since the Pliocene. This tectonic regime has produced several active faults that were the seismogenic sources of multiple recent destructive earthquakes, including those in the 2016–2017 seismic sequence. This sequence comprises the 2016 Amatrice Earthquake (Mw 6.0), the 2016 Mt. Visso Earthquake (Mw 5.9), and the 2016 Norcia Earthquake (Mw 6.5) as the more significant events.

The geology of this region includes a significant presence of Triassic salt, which is organized into several layers due to pre-extensional thrusting. Recent studies have shown that some of the main events during the 2016–2017 sequence nucleated within the salt layers at very shallow depths (3.5–4 km for events up to Mw 5.9; Barchi et al., 2021; Barchi & Collettini, 2019). Moreover, some of the seismogenic faults in this region offset the basement-cover interface.

We believe that a comparison between the southwestern Valencia Trough and central Italy could provide valuable insights into the seismotectonic configuration of our study area, as both regions are actively extending and feature a seismogenic crust with mechanically weak layers.

Following the suggestions of both reviewers we removed from our manuscript the comparison with the Zagros. Additionally, we added a paragraph discussing the analogies between the southwestern Valencia Trough and Central Italy, emphasizing the similar tectonic extensional cadre and the analogous architecture of the seismogenic crust. We use these analogies to discuss potential similarities in the distribution of seismicity in the southwestern Valencia Trough (Lines 664-705/742-813)

S6- I also recommend removing the estimation of the maximum earthquake magnitude based solely on the total fault length, as the results appear unrealistic (Table 1). This approach tends to overestimate the potential magnitude and is not fully supported by seismotectonic principles. Instead, relying on fault surface area provides a more consistent and physically based estimate, as it is directly related to the seismic energy release (Kanamori and Anderson).

We agree with Reviewer 1 that calculations based solely on fault length tend to overestimate the maximum expected magnitude, especially in a region with the geodynamic characteristics of the Valencia Trough. We also concur that estimations based on fault surface area provide a more reliable constraint on the seismic potential of active faults.

Therefore, as suggested by Reviewer 1, we believe it would be appropriate to include in Table 1 the results of maximum magnitude calculations based on fault surface area. We originally included the length-based calculations to highlight the tendency for overestimation. However, the scaling relationships based on fault length, such as those proposed by Wells and Coppersmith (1994) and Stirling et al. (2002), are widely used in the literature. As such, we consider them a useful reference to frame the discussion on seismic potential.

Rather than removing the length-based estimations, we include a new version of Table 1. In this new version, both area- and length-based relationships are used to compute the main seismic parameters.

S7-Conclusions have to be revisited. Some relevant information derived from your results are missed.

We are grateful to Reviewer 1 for pointing out this issue. As noted, some important information is missing from the conclusions section—particularly the seismic characterization of the active faults. We completed the conclusions section of our revised manuscript by adding the missing information, i.e., the seismic characterization of the active faults of the southwestern Valencia Trough.

Technical suggestions and questions

TSQ1-*Page 4; Line 85* You refer "mechanical weak layer" to the Triassic evaporitic formation. My question: Are you referring to ductile behavior under a tectonic stress field? If so, how do you estimate the creep movement associated with ductile salt deformation?

“Mechanical weak layer” is a commonly used term in many studies addressing the mechanical behavior of the crust. It refers to a layer with lower rupture or ultimate strength than the surrounding crust, regardless of whether its behavior is brittle or ductile.

In our context, as mentioned in the manuscript, the Triassic evaporitic succession is considered a “weak layer”, as it acts as the regional detachment. However, we believe that a detailed characterization in terms of ductile or brittle behavior, as well as an estimation of the creep associated with the potential ductile deformation, would require extensive quantitative analyses that go beyond the scope of our study.

Therefore, we consider that a qualitative description of the Triassic layer as a weak layer, supported by robust literature data, is sufficient for the purposes of our work.

TSQ2- Reading the whole manuscript, I still do not fully understand what you mean by the term “mechanically weak layer” regarding the evaporite Traissic layer. Could you please clarify its implication for the seismogenic behavior of the fault system?

Are you suggesting that such a weak layer:

- **makes the system more prone to triggering earthquakes?**
- **would favor medium-sized events without significant tectonic strain accumulation?**
- **or behaves differently in terms of long-term stress buildup?**

A clearer explanation would help in understanding the role of this layer in the seismic cycle.

When we refer to the Triassic succession as a “mechanical weak layer,” our intention is to highlight its influence on the vertical propagation of seismic rupture, as discussed in several parts of the manuscript. However, Reviewer 1’s comments suggest that this point is not clearly presented.

To address this, we clarified and emphasized our use of the term “mechanical weak layer” from the beginning of the manuscript. We added explanatory sentences to the introduction, discussion, and conclusions sections to underline that when we mention the influence of the mechanical weak layer, we are referring to how this layer could arrest the vertical propagation of potential ruptures (lines 83/83, 611-612/686-688, 905-906/1023-1024)

TSQ3- The Cullera Fault appears to show a decrease in slip rate from the Pliocene to the Quaternary (Fig. 8). Could the authors clarify the underlying reason for this apparent behavior? Do you have a conceptual model that could explain this trend? Is it a Nubia plate deceleration?

We thank Reviewer 1 for highlighting this issue. As noted, the offset of markers observed in the seismic lines suggests a decrease in the slip rate of the Cullera Fault—from 0.40 ± 0.1 mm/year during the Pliocene to 0.15 ± 0.1 mm/year during the Quaternary.

Several factors could explain this decrease. As Reviewer 1 suggests, the complex geodynamic interaction between the Nubia and Eurasia plates may be one contributing factor. Additionally, as discussed in Section 6, the evolution of this salt-influenced fault is governed by both tectonics and salt withdrawal. Thus, the fault slip rate reflects a complex interplay between these two mechanisms.

A reduction in the tectonic component of deformation, as proposed by Reviewer 1, could be one explanation. However, a decrease in salt-related displacement could also account for the observed variation. While the available data allow us to discuss which of these mechanisms may have been dominant during the Plio-Quaternary period, we believe that a comprehensive explanation of the slip rate decrease during the Quaternary would require a model integrating both kinematic and dynamic data for the region.

Our results contribute to clarifying the kinematic framework, but additional data are needed to address the dynamic aspects. Nevertheless, we agree with Reviewer 1 that this is an important issue worth mentioning. We added to section 5.1, where slip rate of the Cullera Fault is presented, a sentence underlining this slip rate decrease and mentioning the potential role of the complex geodynamic interaction (lines 408-410/450-452). Furthermore, we also extended the discussion in section 6 (lines 587-596/657-669) regarding the interplay between tectonics and salt withdrawal in the creation of accommodation space. In this new version of our discussion, we postulate that the interplay between these two mechanisms could also play a role in the evolution of the fault slip rate.

TSQ4- The curves of the Figure 10, Throw depth (T-z) and expansion index plots for the Cullera Fault computed from profiles SGV01-115 and SGV01-117, show a fault throw variation. Could the geometry of these curves be explained by the listric geometry of the Albufera Fault? Variations in fault throw along planes with different dips could potentially generate this type of curve. Could the authors clarify if this interpretation is consistent with their data?

As Reviewer 1 points out, throw along normal listric faults varies with depth due to the curved geometry of the fault plane. Consequently, a passive horizon located at a deeper structural level experiences greater displacement than one situated in the shallower part of the structure.

However, in the case of the Cullera Fault, the horizons analyzed are not passive; they were deposited contemporaneously with fault displacement. This has two main implications: i) The position of the horizons relative to the fault changes over time, and ii) Younger markers have been affected by fault activity for a shorter duration than older markers.

Therefore, we propose that the upward decrease in fault throw observed in Figure 10 is a result of the differing ages of the horizons—older horizons show greater offset because they have been displaced over a longer time interval.

In any case, Reviewer 1's comment clearly indicates that the reasons behind this throw decrease are not sufficiently addressed in our current manuscript. We added to the revised version of our manuscript a few sentences indicating that the throw decreases is likely related to the different ages of the horizons (lines 511-514/558-561)

TSQ5- The accommodation space created by the Albufera Fault, and cited in the line 559, page 30, can be explained by salt- tectonics? Please explain your model.

The mechanisms responsible for the creation of accommodation space along the Cullera Fault are extensively discussed in our manuscript (lines 559–600). However, Reviewer 1's comment suggests that the connection between the description of the accommodation space (lines 548–558) and the subsequent discussion of our hypothesis for its formation (lines 559–600) may not be sufficiently clear.

To address this, in the revision version of our manuscript we added a sentence that explicitly states that in this section the origin of the accommodation space of the Cullera Fault is discussed (lines 562-564/616-617)

TSQ6- Line 641 Tectonic driving mechanism and differences between tectonic driving and sal-withdrawal driving. I have some doubts regarding this point. The "mechanically weak layer" is described at a depth of 2–5 km, but tectonic earthquakes with significant magnitudes (M6–7) typically require rupture depths greater than this. Moreover, the regional tectonic strain is expected to be distributed below the weak layer as well. This raises the question: does the fault release only the strain accumulated in the supra-salt section, or can it also rupture deeper segments (>10 km) where larger tectonic strain is stored? A discussion of this point would clarify the seismogenic potential of the fault system.

In this comment, Reviewer 1 refers to two distinct aspects.

First, Reviewer 1 notes that significant earthquakes (Mw > 6) typically nucleate at depths greater than 5 km. However, recent events in central Italy and France have demonstrated that very shallow earthquakes of moderate magnitude (Mw 5–6) can also occur (Chiaraluce et al., 2017; Godano et al., 2025; Improta et al., 2019). In the southwestern Valencia Trough, the thickness of the supra-salt succession is slightly less than 5 km. Therefore, while the probability of a significant earthquake nucleating within the supra-salt succession is low, it is not zero.

Assuming that such an event could occur, our aim is to evaluate the seismic potential of these (unlikely) supra-salt ruptures. In other words, we focus on describing a characteristic event rather than assessing its likelihood. Reviewer 1's comment suggests that this distinction was not clearly stated in our manuscript. We added several lines to our revised version of the manuscript (lines 621-651/658-730) to clarify that we are assessing the seismic potential of suprasalt ruptures. Also, we clearly state that these ruptures are unlikely.

Secondly, Reviewer 1 asks whether “the fault releases only the strain accumulated in the supra-salt section, or can it also rupture deeper segments.” In our manuscript, we explicitly state that a tectonically driven earthquake could rupture the entire seismogenic crust. This implies that strain accumulates in both the supra-salt and sub-salt successions, as tectonic stress affects the entire crust.

Once again, Reviewer 1’s comment indicates that this point may not have been clearly conveyed. We added to the new version of our manuscript a sentence explaining that tectonic stress accumulates in the entire crust and that, therefore, a rupture involving both supra and subsalt successions is also possible (lines 623-625/699-702).

TSQ7- Methodology and the “correction factor” (line 712, page 36). I agree that using the total fault length to estimate earthquake magnitude through common empirical relationships is not the most reliable approach. However, the total fault surface area provides a more reasonable approximation because it is directly related to the seismic energy released during an earthquake (see Kanamori and Anderson). The main concern with introducing a “correction factor” is the potential to generate an artifact in the magnitude estimation, which could lead to biased results if not properly justified or calibrated. On the other hand, why the “aspect radio” factor of the active fault could improve the magnitude estimation? It is not clear in the text.

We agree with Reviewer 1 that using an area-based scaling relationship is a more reliable approach for estimating the seismic potential of a fault. While all scaling relationships are based on extensive empirical observational data, they do not explicitly account for the specific geological and mechanical characteristics of the seismogenic crust, as we mention in our manuscript (see also response to Reviewer 2).

Our goal is to propose a method to refine these scaling relationships by incorporating the mechanical properties of the crust. This is why we suggest using the aspect ratio as a correction factor for the fault area used in magnitude calculations.

Once again, Reviewer 1's comment indicates that our objective may not have been clearly stated in the manuscript. Therefore, several sentences (lines 714-718/854-858) were added to our new version of the manuscript in order to clearly state that the approach we propose is to use a correction factor to refine the empirical scaling relationships.

TSQ8- PAY ATTENTION! revise the fault areas of the Table 2. There are some incongruences with the values obtained from the 2D Move analyses and the values indicated in the Table 2 for the Cullera, Albufera and Valencia faults (pages 20, 24 and 27).

As Reviewer 1 points out, there appears to be an inconsistency between the input area used for calculating the maximum expected magnitude and the fault areas reported in Section 5. This apparent discrepancy arises from the use of two different calculation methods.

The values presented in Section 5 are direct measurements obtained from the fault surfaces in our 3D models. In contrast, in Table 2 (Section 8), we chose to compute fault area by multiplying fault length by fault width. This simplified approach was preferred because, in a subsequent step, we apply a weighting using the aspect ratio as a correction factor.

For this weighted calculation, we use the thickness of the supra-salt succession as an input parameter. Therefore, the only feasible way to compute the fault area in this context is by multiplying this thickness by the weighted fault length. To ensure consistency when comparing magnitude estimates derived from both weighted and unweighted areas, we used the same calculation method for both. Also, this calculation would be easily implemented in regions where detailed subsurface data are available.

This methodological detail was not explained in the manuscript. This issue was addressed by adding some sentences to our manuscript that clarify the reason why we use the simplistic calculation of the fault area instead of those obtained from our 3D models (lines 791-795/901-905).

TSQ9- Table 2. I don’t understand how a great fault area triggers an earthquake of lower magnitude as appeared in Albufera and Valencia faults). Please, revise carefully TABLE 2.

We thank Reviewer 1 for the careful revision. As noted, there was an error in Table 2, where the Mw values for the Albufera and Valencia faults were inadvertently swapped. This error has been corrected in the new version of our manuscript (see new version of Table 2).

Additionally, I have attached the PDF manuscript with some minor detailed comments posted into the PDF file.

We carefully revised all the Reviewer’s suggestion included in the pdf file and addressed all his minor comments.

Reviewer 2

The authors present a detailed model for stratigraphy, lithology and structure of the southwestern Valencia Trough, based on vintage and modern seismic reflection lines, well data, electric data, gravity data, and taking into account previous studies. The presented reflection lines appear well readable, and the interpretation appears clear or at least reasonable. A crucial feature of the model is a layer of evaporitic Upper Triassic (Keuper) rocks, that behaves mechanically weak and may induce decoupling of the Palaeozoic–Middle Triassic basement from the Upper Triassic –Quaternary units.

The authors identify three major faults in the study area that cut through the salt layer (Albufera, Valencia and Cullera Fault). They appear to be disturbed in their geometry by the Keuper unit in some instances (profiles in Fig. 6a and b), while in other profiles they show a more classic, continuously listric geometry of upper crustal normal faults. The authors estimate 3D fault geometries, slip rates and attempt to distinguish tectonic deformation from salt withdrawal.

So far, this study applies careful analysis and reasoning and is a solid and relevant contribution for understanding a very interesting setting. In my opinion, it is necessary to comment on the seismotectonic implications of the fault geometry. How can we explain the presence and possible interaction of perpendicular normal faults? Could the authors name and compare to other places on Earth where perpendicular normal faults are present? Are there hidden strike slip faults (not easy to identify in sections) necessary to reconcile the geometry (apart from a right-lateral component on the Albufera fault)? Are all faults active at the same time (in particular the Cullera fault is not consistent with available focal mechanisms, and according to throw-depth plots, activity of the Cullera fault has decreased significantly in the Quaternary)?

There appears to be some misunderstanding regarding the kinematics of the faults. In lines 449–465, we present data supporting the interpretation of the Albufera Fault as an oblique structure, with both right-lateral strike-slip and normal components.

However, since the lateral component cannot be observed in the seismic profiles, this aspect may not have been clearly conveyed in the manuscript. To address this, in the revised version of our manuscript, explicit mentions to the oblique kinematics of Albufera and Valencia faults have been added in the sections where these structures are described (lines 428-431/471-474 and 474-478/521-525).

Furthermore, we added indicators to fault traces in figures 5 and 6 to underline the kinematics of the faults

In contrast, I find the second part of the manuscript (chapters 7 and 8) problematic. Here, the authors shift from the general analysis to the specific focus of mechanical layering and seismic potentials. They distinguish rupture of the entire seismogenic crust or only the suprasalt layers. They hypothesise that the weak layer could limit the width of seismic ruptures, in which case the standard scaling relationships to relate fault length to magnitude no longer apply. This is a valid and interesting question, however in my opinion, some decisions taken by the authors are not justified and major revision is required in this part.

My first concern is the downdip width for suprasalt ruptures. The value of 7.1 km chosen by the authors allows for significant magnitudes to be obtained for suprasalt ruptures with reasonable aspect ratio, however the value should be much smaller according to the profiles shown in Fig. 6. The depth of the Keuper unit at the fault locations is between 1.5 and 3 km, and fault dip is 60 degrees or larger (not 45 degrees, as the authors assume), which rather suggests average downdip width of 3 km or less. Suprasalt ruptures could reach ~15 km^2 and magnitudes slightly above 5, which is interesting, but not relevant to define the seismic potential.

We agree with Reviewer 2 that some of our calculations for fault downdip width should be revisited. In the initial version of our manuscript, we used a simplified approach by assuming a uniform thickness of the supra-salt succession across the entire study area. However, this represents an oversimplification of our own data.

As previously mentioned, the Albufera Fault exhibits oblique kinematics, with a dominant strike-slip component and a minor normal component. As a result, the thickness of the supra-salt succession in the downthrown block of the Albufera Fault is thinner than in the other two active structures. Similarly, for the Valencia Fault, assuming a 5 km thickness for the supra-salt succession is also an overestimation. Consequently, the downdip width and the resulting estimates of seismogenic potential should be recalculated for these two faults.

Regarding the Cullera Fault, the total thickness of the supra-salt succession at its location is approximately 4.8 km (see Fig. 6a, b, and c). That said, we would like to emphasize that the 200 m difference between 4.8 and 5 km falls within the margin of error for depth conversion and implies a level of precision that exceeds the accuracy supported by the data.

We recomputed the maximum magnitudes under the different scenarios following the suggestion of Reviewer 2. That is, using the values of the suprasalt successions measured at the location of the faults. The text of the new version of our manuscript encompasses these new calculations (section 8.2 and 9). Figure 12 was also amended.

Regarding the apparent discrepancy between the fault dip used in our calculations (45º) and the dip angle suggested by Reviewer 2 (60º) we would like to emphasize that seismic sections shown in figure 6 are vertically exaggerated. This exaggeration is indicated in the figure by the difference between the vertical and horizontal graphic scales. We added indications about the vertical exaggeration to all sections in figure 6. Also, we included a mention to that in the figure caption.

Furthermore, it is not clear if ruptures in the Valencian Trough do actually nucleate in the thin suprasalt layer. The comparison with the mechanical layering in Iran is not helpful here, as the tectonic regime is compressive and the fault geometry is different, the salt layer is significantly deeper, and yet the relevant earthquakes in the Zagros belt do nucleate in the subsalt layer, NOT in the suprasalt layer (i.e., they may be contained below the salt layer, or occasionally involving both, sub and suprasalt units).

Both reviewers expressed concerns about our comparison between the Zagros Belt and the study area, due to differences in tectonic regime and the depth of the mechanically weak layer. We acknowledge that this indicates the comparison is not sufficiently supported in our manuscript.

Therefore, as mentioned in our response to Reviewer 1, we believe it is best to remove this section from the manuscript. As previously noted, we consider that a comparison with central Italy would be more relevant and meaningful for our discussion. (See answers to Reviewer 1)

Unfortunately, available depth estimates are insufficient to resolve this issue. Those are offshore earthquakes, so we have a lack of short distance observations, and the fact that the catalogue reaches back to 1950 (Fig. 2) does not make it any better... In consequence, the disclaimer in the manuscript "depths assigned to these earthquakes present high uncertainties" should lead us to acknowledge that there is no evidence for significant suprasalt earthquakes in the study area. If we decide to believe the depths in Fig. 2, it even appears as if the suprasalt layer was depleted of earthquakes.

We agree with Reviewer 2 that there is no direct evidence of significant supra-salt earthquakes in our study area. However, this region is characterized by low to moderate seismicity, with expected recurrence intervals for significant events likely spanning hundreds to thousands of years.

Therefore, we believe that the absence of supra-salt earthquakes in the instrumental record should not be interpreted as evidence that such shallow events cannot occur—absence of evidence is not evidence of absence. That said, we acknowledge that the probability of occurrence for these supra-salt earthquakes is low.

It seems this point was not sufficiently emphasized in the initial version of our manuscript. As mentioned in the response to Reviewer 1, we added several lines to our revised version of the manuscript (lines 645-652/723-730) to clarify that we consider the potential suprasalt ruptures unlikely. Furthermore, the comparison with central Italy included in this new version of our manuscript also support that very shallow earthquakes with significant magnitudes are possible in areas with analogous structural and tectonic arrangement of southwestern the Valencian Trough.

More fundamentally, the presented sections show only limited evidence for mechanical and seismogenic decoupling between subsalt and suprasalt units. Among the shown profiles the Cullera fault in Fig. 6a, b displays a listric profile that may be flattening out in the Keuper, supporting the presence of such a mechanical detachment horizon. However, other faults cross the Keuper with more or less planar geometry, not suggesting any decoupling. In general, the salt horizon is discontinuous under some of the profiles and varies in thickness, and some reasoning or comparison to other settings should be provided to strengthen the mechanical model.

As Reviewer 2 notes, one of the key pieces of evidence for mechanical decoupling between the supra- and sub-salt units is the listric geometry of faults that flatten within the mechanically weak layer. This is clearly observed in the case of the Cullera Fault, as shown in Figure 6 and highlighted by Reviewer 2.

The same applies to the Valencia Fault. In Figure 6a, the fault trace is represented by the eastern termination of the Mesozoic–Quaternary succession, which displays a curved (listric) geometry that also flattens within the Keuper evaporitic unit. Similarly, the Albufera Fault, as shown in Figures 6d and 6e, exhibits a listric geometry. Although the quality of the seismic profiles makes it difficult to identify the detachment horizon with certainty, we hypothesize that the Albufera Fault also flattens within the Keuper unit, which is a well-established regional detachment level (Guimera, 2018; Guimerà & Álvaro, 1990; Muñoz Martín & Vicente Muñoz, 1988).

Reviewer 2's comment highlights the need to better address and discuss the mechanical decoupling between the supra- and sub-salt successions in our manuscript. In the revised version of our manuscript, we added several lines emphasizing the main features that evidence the decoupling between the supra- and subsalt successions (lines 328-333/355-359). Also, we included the necessary references where this decoupling was initially proposed.

Minor comments:

Introduction: line 75 "these relationships do not consider the influence of potential heterogeneities within the seismogenic crust": these relationships are empirical, which means they DO consider the real influence of all heterogeneities that were

present around the seismic ruptures that were evaluated to build them. The point is rather that the mean regression we use averages out those heterogeneities…

We rephrased the sentence pointed out by Reviewer 2 (lines 76-83/76-83). In the new version of our manuscript, we indicate that the influence of a mechanical layering within the seismogenic crust is implicitly considered in the empirical relationships, but that, these relationships average out this influence.

Fig. 1: Could you put labels (dates) on the focal mechanisms?

We added the requested the labels.

Fig 2, depth histogram: Looks like depth 0 is excluded (which may mean explosions or fixed depth), please state explicitly. Y-axis annotations are not equidistant and difficult to associate, please check.

Figure 2 was corrected following Reviewer 2 comment. Also, we add a sentence to the figure caption that indicates that depth 0 is excluded, as these is a fixed depth.

I'd suggest rename section 3, "Methods", to "Data", because that's clearly the main focus here.

We renamed this section following the reviewer comment.

Fig. 3: Could it make sense to distinguish modern lines and vintage lines in the figure? (from your description in the text, I guess I can, but if you use different line style it would be easier).

We followed this suggestion, using different line styles for vintage and modern seismic lines.

On p. 20 you say the Cullera Fault is a planar fault (inside the basement) without significant tilting of the basement-top horizon, however this is in contradiction with the interpretation in figure 6e, where you draw a listric fault that would flatten out near 5 km and shows tilted units in the hanging wall.

It should be noted that seismic profile in figure 6e (and 6d) is not as deep as those in figures 6a-6c. Therefore, the basement cannot be observed in profiles 6d and 6e. Actually, as we mentioned above, fault traces depicted in figures 6d and 6e flattens out in the suprasalt succession. We added a mention to this point in the figure caption to avoid confusion.

In Section 5.3, you claim to "define for the first time the Valencia Fault", but I wonder if the Valencia Fault could be equivalent to the fault labelled as Central-Western Cabo Cullera Fault in Fig. 1 / Qafi?

We agree with Reviewer 2 that our Valencia Fault may correspond to the Western Cabo Cullera Fault shown in Figure 1. However, since we present a new structural interpretation for the entire study area, we believe that retaining the name "Western Cabo Cullera" could lead to confusion. This is because that name has previously been associated with other faults in the sector (e.g., Central Cabo Cullera, Eastern Cabo Cullera, etc.).

For this reason, we chose to assign the name "Valencia Fault" to this structure. Before making this decision, we consulted the author who originally defined the Western Cabo Cullera Fault, and he agreed with our naming choice (Perea, pers. comm.).

Nevertheless, we acknowledge that the potential correlation between our Valencia Fault and the Western Cabo Cullera Fault should be mentioned. Therefore, we included a sentence in the new version of our manuscript acknowledging that the Valencia Fault could correlate with the Western Cabo Cullera Fault of Perea (2006) (lines 471-472/517-518).

In chapters 6 and 7, some explanations are quite long and complicated and some of the information appears repeatedly. Please check writing of this part.

We have rewritten parts of these section avoiding repetitions in order to make the discussion clearer.