Dear Editor, Associate Editor, and Reviewers,

We would like to express our gratitude for the valuable and constructive comments provided. We have addressed most of the critical points raised.

Responses to reviewers comments can be found below. The questions are presented in black, and our answers are shown in blue.

In addition, all changes made in response to the first review are highlighted in yellow, while those related to the second review are highlighted in orange for easier reference.

Thank you for considering our answer.

Sincerely,
Bénédicte Donniol Jouve on behalf of the co-authors

This manuscript lacks significant innovation in its data, methodology, and results, which are critical for a high-impact publication.
In terms of data, the study relies heavily on existing models, such as those by Piña-Valdés et al. (2022) and Danciu et al. (2024), without presenting any novel or unique datasets that could advance the field of seismic hazard assessment. Furthermore, the study does not provide additional insights into previously underexplored or debated aspects of seismic and geodetic moment rate comparisons.

We are quite surprised to read such a sentence.
Since 1999, a number of seismic hazard models have been published at the scale of Europe (GSHAP, SESAME, ESHM13). This is the first time that the source model (earthquake forecast) of a European seismic hazard model is tested against a fully independent observation, strain rates based on GNSS. The ESHM20 model (Danciu et al. 2024) is tested against strain rates derived with the method of Piña-Valdés et al. (2022). Piña-Valdés et al. (2022) only produce a best estimate model. Here, we determine a distribution of strain rate estimates by exploring uncertainties at all steps in the strain rate estimation and their conversion into geodetic moment rates. As far as we know, our study is the first one that makes a comparison between seismic and geodetic moment rates at the scale of Europe, and that systematically tests and discusses the similarities and discrepancies for all source zone areas of the ESHM20 model. We believe that our results provide important insights for the community of scientists working on seismic hazard and active deformation in Europe.

From a methodological perspective, the analysis employs conventional approaches to compare geodetic and seismic moment rates. However, it fails to incorporate more advanced or state-of-the-art techniques, such as cascading rupture models or innovative inversion frameworks, which could significantly enhance the robustness and applicability of the results.

The strain rate model is obtained applying a state-of-the-art inversion methodology.
We don’t fully understand why cascading rupture models are mentioned. There are no cascading rupture models in probabilistic seismic hazard assessment, unless earthquake simulators are used, which is currently completely impossible to implement at the scale of Europe.

Regarding the results, while the manuscript identifies general agreements and discrepancies between geodetic and seismic moment rates in different regions, the findings largely reaffirm existing knowledge rather than delivering novel or transformative insights.

There are plenty of publications that compare geodetic and seismic moment rates. There are very few publications that compare the moment rates of a long-term earthquake forecast, built for PSHA, with respect to the moment rates inferred from geodetic strain rates. A long-term earthquake forecast is a model, often including an extrapolated part (e.g. extrapolation of the Gutenberg-Richter model in the upper magnitude range). It is of high interest to test the model against independent observations. Again, it is the first time an earthquake forecast built at the scale of Europe is compared to geodetic moment rates estimate build at the continental scale. This is one of the very few studies where earthquake recurrence models built for area source zones are tested against geodetic moment rates.

Key discrepancies, such as those observed in low-to-moderate seismic activity zones, are not explored in sufficient depth to yield actionable conclusions or guide future improvements in hazard modeling.

In the case of very low seismicity area sources, we observe poor or no correlation between moment inferred from the long-term earthquake recurrence model and geodetic moment. We write that in these areas, for now we believe that GNSS measurements cannot be used to constrain earthquake forecasts. We perform a comparison at the scale of Europe, this is true that more work is required to understand the differences obtained at local scale.

Although the authors have addressed some comments from the previous review round and made revisions, the core issues regarding the manuscript’s originality, scientific contribution, and added value remain unresolved.
Overall, the manuscript's findings offer limited utility for advancing the understanding or practical application of strain rate and seismic hazard models.
Based on the aforementioned considerations, I recommend rejecting the manuscript for publication.

We must here remind the comments made by 3 reviewers :
RC1: “This is a quite interesting paper which focuses on the comparison of geodetic and seismic moment rates across Europe. The approach is successful in spite of the large area examined and its high seismotectonic heterogeneity.
RC2: “Although geodetic observations are not still routinely used to assess the seismic hazard in a region due to the lack of a long-term series of geodetic measurements, models based on geodetic observations have been shown to provide forecasting skills where traditional methods to assess seismic rate models have not (e.g., Rhoades et al., 2017; Rollins and Avouac, 2019; Gerstenberger et al. 2020). In this context, this manuscript is a step forward in this direction. ”
RC4 : “The subject is fascinating and worth to be published.”