Response to Reviewer #4 Alexandra Carvalho

We highly appreciate the reviewer's insightful comments and have revised our manuscript, nhess-2022-46, entitled, "Quantifying the probability and uncertainty of multiple-structure rupture and recurrence intervals in Taiwan," accordingly. Below, we have quoted the comments in italics and provided our detailed responses. All the changes are underlined in the revised manuscript.

Nevertheless, theories or new approaches and assumptions should rely on physical processes and need to incorporate the comprehension of the reality and I have some doubts about validity of some assumptions, namely:

- what is the meaning of summing slip rates of the different faults?

The estimate of the multiple-rupture slip rate through a sum is based on the assumption that the slip of an earthquake is equal to the cumulative slip during an interseismic period. Since the slip of a multiple-structure rupture is the result of contributions from different structures, we sum the slip rates contributed from the individual structures.

To better describe our algorithm for evaluating the recurrence interval of multiple-structure ruptures, we have adjusted the manuscript to first introduce the slip rate partitioned to individual structure ruptures (equations 8 and 9), followed by the obtained partitioned rates (equations 10 and 11). By combining them, the slip rate partitioned to the multiple-structure rupture from the original structures could be obtained (described in lines 123-140).

- Why the distance between two faults must be less than 5 km? is there any evidence that there is no Coulomb stress transfer for distances greater than 5 km that can trigger a fault? I could recommend a little more discussion on this issue.

We expected that a long distance between two structures could result in it being difficul for the pair to rupture simultaneously. Thus, we followed the criterion by the UCERF3 (Field et al., 2015) and assumed a distance threshold of 5 km.

We were aware that an earthquake with a large coseismic slip dislocation could result in a significant stress change at distance and then searched the pairs with longer distances and significant stress increase.

Two additional distance thresholds of 10 and 20 km were considered (Table 7). Generally, potential magnitudes of these structures are relatively large, which could result in leger stress perturbation.

The title "Quantifying the probability and uncertainty ...." do not reflect the content of the paper, in my opinion, as it leads to an expectation of a sensitivity study on key parameters that might have impact on results. The only parameters changed were the Coulomb stress and the structure rake angle. Are there any other parameters that can affect results? Were these parameters chosen because they are the ones with the most impact? I was expecting a more exhaustive study on that.

We followed the reviewer's comment and included additional discussion on uncertainties from various parameters, including the effective coefficient of friction (Table 6, lines 259-267), rake angle rotation (Table 8, lines 282-285), stress threshold of ΔCFS (Table 3, lines 89-94, 268-272), and distance threshold (Tables 3 and 7, lines 89-94, 268-272, 273-281). Our approach indicated various rupture pairs and quantified uncertainties. These outcomes were able to be incorporated into a probabilistic seismic hazard assessment through a logic tree.

Finally, I would suggest a different way to present so many and so similar equations, as it become difficult and not very interesting to follow.

We have rearranged the description of the procedure, simplified some equations, and removed several examples in Chapter 3. Hopefully, the current manuscript is easily understandable and meets the standards of *Natural Hazards and Earth System Sciences*.