

# ***Interactive comment on* “The role of asperities in seismicity frequency-magnitude relations using the TREMOL v0.1.0. The case of the Guerrero-Oaxaca subduction zone, México” by Marisol Monterrubio-Velasco et al.**

## **Anonymous Referee #2**

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In the manuscript the authors conducted synthetic seismicity distribution by considering the aspect ratio of a single asperity, and compared the numerical results with observations in the Mexican subduction zone. In general, the synthetic results and data showed good consistency. The authors also pointed out that the aspect ratio of the asperity played critical roles in magnitude-frequency distribution. Over a critical value the system tended to become dominated by characteristic earthquakes. I think that this study is important to evaluate seismic hazard. But the manuscript needs substantial improvement, mostly in structure and writing. Below please find my detailed

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comments.

The motivation in the Introduction was not clear. It is pretty odd to have such a long paragraph, with inserting bullet points on specific regional settings. It is very difficult to get the major points of this study, and what might be innovative comparing with previous approaches that had been carried out in the same region. I feel that rewriting the Introduction is necessary, and recommend the following structure based on my reading.

You may start from the significant of G-R law on probabilistic seismic hazard analysis, but it is necessary to highlight why synthetic seismicity distribution is important (the major point to deliver in this study). For a region that has very few earthquakes, it is straightforward to produce synthetic seismic distribution. But for the Mexican subduction zone where earthquakes are frequent, with recent great earthquakes ( $M > 8$ ), why is it significant and necessary to conduct such synthetic GR law analysis?

Then you can highlight the important of asperities and the effects of aspect ratios of asperities on GR law. If it has not been considered in previous synthetic seismicity generator, it serves as a natural innovative point of this study.

It will be very helpful to explain how the asperities were identified in different subduction zones that were mentioned in lines 35-40. Why do they have anything to do with TREMOL, which was first introduced in line 41? The statement here was really disjointed and should be rewritten.

Overall the grammar in the manuscript is OK, but there are lots of fragmented and/or long sentences, which are sometimes awkward to read. For example, the first sentence in section 2 contains “low magnitude previous events”, which should be “previous low-magnitude events”. Many other words share the similar problems and need a thorough editing work.

Some texts/paragraphs should belong to Introduction or Discussion, but were mixed in

different sections. Here I listed a few, but not all of them. Line 59-61: statement of asperities should be moved into Introduction. Some descriptions in section 3 could be moved into Introduction as well.

For the results, I think the implications of Figure 12 are important on earthquake physics. What are the potential underlying physics that lead to such transition of GR distribution to a more characteristic earthquake pattern?

Figure 2-4 can be either merged together, or grouped together to better illustrate the locations of observed seismicity.

I suggest deleting “for any type of” in the first sentence of the abstract.

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