Nat. Hazards Earth Syst. Sci. Discuss.,
https://doi.org/10.5194/nhess-2018-51-RC2, 2018


Natural Hazards and Earth System Sciences
Discussions



# *Interactive comment on* "Revisiting Seismic Hazard Assessment For Peninsular Malaysia Using Deterministic And Probabilistic Approaches" *by* Daniel Weijie Loi et al.

**Anonymous Referee #2**

Received and published: 29 March 2018

This is a revision for the paper entitled "Revisiting Seismic Hazard Assessment For Peninsular Malaysia Using Deterministic And Probabilistic Approaches" By Daniel Weijie Loi et al. The paper is well organized but a major revision is required before publication. Following are my main points to be considered: 1- The used catalog is not subjected to completeness analysis, therefore, the authors consider the earthquakes are complete for the entire magnitude range (4-9.1) along the catalog period (1907-2016). I am highly skeptic about this. Please provide, at least, a completeness analysis showing that earthquakes of magnitude 4.0 are complete along the entire period. 2- The catalog shows no earthquakes generated by the local intraplate faults. Really I do not know if these faults are active or inactive one to be included or excluded from



Printer-friendly version

Discussion paper

the calculations. Please follow the following points: a- Provide evidences for the activity of all mapped major intraplate faults. b- Define their dimension and rate of slip along each of them. c- Define the associated maximum magnitude and recurrence interval based upon the above data. If these faults are active, then the seismic hazard will change dramatically. Using the maximum recorded PGA values is not the proper way for seismic hazard assessment. 3- Bases for subdividing SSZ into 7 areas and line seismic source zones are unclear and very confusing. Sumatra earthquake 2004 initiated at latitude near 3.2 degree N and extended for about 1200 km northward till about 14 degree N, rupturing at least zones 3, 2 and 1. These zone were ruptured in one earthquake, therefore, I found it strange to subdivide it into three different seismic zones. Segments 4, 5, and 6 have almost the same slip rate, thus their segmentation is questionable for me. Generally segmentation along SSZ is unclear, therefore, geological, tectonic, seismological evidences should be provide to support the current segmentation. 4- According to Wells and Coppersmith, 1994, Strasser et al., 2010, and Blaser et al., 2010, all the provided fault lengths can not produce the expected magnitudes in Table 3. 5- Gutenberg-Richter (1944) approach to define b-values imposes the unrealistic assumption that the maximum potential earthquake is unbounded and unrelated to the seismotectonic setting. Therefore, I prefer to use the truncated exponential model instead of G-R (1944) model, which contradicts the idea of maximum magnitude as it is open from its both ends. 6- Figure 5 shows a very strange piece of data, where the logarithm of the cumulative annual frequency for earthquakes with magnitude 9.1 is Zero, meaning that the annual frequency of this range of magnitude is 1.0. Actually we do not have an earthquake with magnitude 9.1 or larger every years in this area. A great mistake is committed and should be reconsidered. Authors seem to use the same recurrence parameters for both area and line sources. Please use rate of slip to define the recurrence parameters for the fault sources. But firat authors should show how did they calculate the slip rate and show whether their calculations contain creep components or not and show whether the time span for calculation the slip rate is representative or not. Comparison of the results using the area and line sources





Printer-friendly version

Discussion paper

should be provided. 7- According to Figure 5, the maximum observed magnitude at zones 1, 2 is less than 7.6 (1.5 magnitude unit less than the maximum magnitude assigned for these seismic zones). Please comment. Such inconsistency is observed at many other regions. The solution is to combined the provided segmented seismic sources into proper larger ones. 8- Local intraplate faults and the seismic activity at Sabah are not included in the PSHA. 9- The distances employed in the Ground Motion Prediction Equations (GMPE) is the hypocentral distance as indicated in figure 6. This kind of distances considers the earthquake as a point and can not be used for earthquakes that cause ruptures up to 1200 km. Even it can not be used for local source that can produce earthquakes of magnitude 5.0. Recent GMPE avoid using the hypocentral distance as it overestimates the distance. Although the authors used local GMPE, but It is not appropriate for the current use. I suggest to use Rrup or Rjb within appropriate GMPE for the studied area. Please always provide more details about the used GMPE (e.g. minimum amd maximum distance for applicability, type of horizontal ground motion used, tectonic environment, magnitude used, shear-wave velocity, etc.). Of most important is to define the standard deviation for the used GMPE 10- GMPE used seems not to calculate the ground motion in terms of response spectra, which are the most important input parameters for engineers, especially if they are asked to use the IBC codes. PGA is OK if the Euro code is to be applied, but it is just an isolated value on the time history and neither represents the ground motion nor correlates well with the damage potential of shaking. I highly recommend to provide hazard maps in terms of short period and 1.0 sec spectral period for the two return periods (475 and 2475 years) in addition to the PGA maps. 11- The main advantage of the PSHA is the combination of all magnitudes, distances, and effects. Thus all seismic sources that might affect the area of interest should be included in each single run. Separation of SSZ and SFZ in the logic tree is an mistake as it underestimate the seismic hazard. of course, different seismic source models can be used, but in each model all the seismic sources should be used in each single run. For example authors may consider each of SSz and STZ as single or more in one branch of the logic tree while the their preferable

source model is on the other branch. Segmentation of the seismic zone into area and lines zones is acceptable.

MINOR REVISIONS a- Page 2 line 13: unclear b- Page 2 line 20: use scenario instead of value c- Page 3 line 2: add (.) after 2016) d- Page 3 line 20: Provide the magnitude of Sabah earthquakes e- Page 6 line 32: the velocity range should be changed f- Page 10 line 17: It means that data are incomplete for some magnitude range for period 1907-1977. As mentioned above, completeness analysis is a must. g- Page 10 line 23: only if the slip does not has a creep component. Please comment on the creep component in the total slip if any. Figure 1: 1- Some green colors are shown in western Malysia, please correct 2- Symbole of SSZ is inconsistent with the figure 3- The figure should show coordinates, scale and North direction Table 3: 1- Boundary conditions should be modified as the following example (7<Mw<7.9, 7.9≥Mw and so on) Results are not discussed as substantial modification is required before getting the right results

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., https://doi.org/10.5194/nhess-2018-51, 2018.



Printer-friendly version

Discussion paper