

Interactive comment on “Integrated seismic risk analysis using simple weighting method: the case of residential Eskişehir, Turkey” by E. Pekkan et al.

Anonymous Referee #2

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General considerations

The paper deals with the integrated study of two important aspects to be considered in sites exposed to high seismic hazard: the liquefaction and the amplification phenomena. The manuscript could be interesting in view of the possible tangible implications for the urban planning and management of the risk. However, the work cannot be published in the present form as it requires substantial changes.

Flaw issues regard both the clearness of the methodology and the discussion of the data exposed. Furthermore, the authors make an improper use of some technical terms. For example, the title gives emphasis on the “Integrated seismic risk analysis”, while the abstract reports “. . .an integrated seismic hazard map. . .”. It is necessary to

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use properly the terms hazard and risk throughout the paper. Detailed comments of different sections of the manuscript are given below.

Study area (this section is not numbered in the manuscript)

The section mixes up the knowledge of the site under investigation with the state-of-the-art and the methodological approach followed to perform the study (from line 12 to 22 of page 6887). All that makes unclear the path the authors considered to reach the fixed aims. I suggest moving the irrelevant parts in the proper sections (“Introduction” or “Methodology”).

The use of technical terms made to describe the age of alluvium sediments is inaccurate. Terms like “old” and “new” should be replaced with the actual age of the sediments. Alternatively, terms like “ancient” or “recent” should be used respectively (line 6-7 of page 6887).

Only a general description of the groundwater table is given. More details are required as they are pertinent with the liquefaction phenomenon. Therefore, it is necessary to indicate the actual mean depth of the groundwater, especially in view of the fact that the authors have at their disposal a sufficient number of wells for this purpose.

The section should also include a deeper analysis of the regional and Eskişehir historical seismicity. That might be useful when discussing the results of the research. Furthermore, it is strongly recommended that the authors add the seismotectonic setting of the study area due to the circumstance that the Eskişehir city is contiguous to the Eskişehir fault zone and it is located in a complex system of faults among which the North Anatolian Fault Zone.

2. Methodology

2.1. Site amplification

The authors use the V_{s30} values to estimate the seismic amplification at the site under investigation. According to what the authors themselves emphasize in the manuscript,

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many researchers consider this approach as suitable to move towards the seismic amplification. However, even though the use of the Vs30 parameter is widely considered, the literature about the subject does raise some doubts about the uncritical use of the Vs30 parameter. The authors should discuss this in the manuscript. They can refer to the work cited in the proper section (Castellaro et al., 2008).

The authors declare that (pag. 6888, lines 6-7) "...Figure 3 shows that the site amplification formula based on shear wave velocity of Borchardt (1991) (Borchardt et al., 1991) gives a higher amplification value compared to the formulas of other researchers"...and "...This indicates that the site amplification calculation by using Borchardt's (1991) formula provides more accurate risk assessment...". I do not agree with the last statement. Perhaps the authors wished to emphasize that the formula taken as a reference provides a more conservative assessment of the seismic amplification. Conversely, the authors should clarify what they mean.

2.2. Soil liquefaction

The authors perform the soil liquefaction analysis for Eskişehir city using Standard Penetration Tests (SPTs). The literature shows that a detailed and similar analysis was already performed for the same city and approximately for the same study area (Tosun et al., 2011). Therefore the authors, which apparently seem to be unaware of that paper, should compare their work with previously published research, highlighting differences, analogies and possible improvements of their research.

It is not well clear what were the scenario magnitude and the peak ground acceleration level used for their analysis. The choice of these values should be discussed. The authors declare that "...All of the liquefaction analyses were done from the drilling that reached a depth of 20 m..." that seem to disagree with what the authors write in the "Introduction" paragraph, where I read that "...soil liquefaction analyses were conducted on 87 wells at a depth of 30m for Eskişehir..." (page 6885, line 25). These statements should be clarified.

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The General Format for Soil and Ground Study is lacking of the complete reference (page 6890, line 14).

4.3. Simple weighting method

The title of the paper focuses on the "simple weighting method" through which the authors analyze the seismic amplification and liquefaction, jointly. Despite that, the paper does not go through the subject in an in-depth way. As a matter of fact, considering that the authors' intention is to centre the simple weighting method, it is useful to explain the method in details. Furthermore, the authors should include a brief literature overview on the use of the method in others or similar research contexts, discussing advantages, novelty and limitations of the approach.

5 Results

As results of their analysis, the authors make some conclusions about what areas should be considered appropriate to settle a residential area. This is an important tangible output of the research. However, in order to better constrain this research output, I suggest discussing about the joint analysis of the patterns of damage caused by the recent/historical earthquakes (such as the event that hit the city on 1956) and the hazard map deriving from their study. Can the historical data about the seismic damage strengthen the author's findings?

Furthermore, it is important to discuss the relationship between the findings of the authors and the current urban layout. For example, what conclusions emerge from the comparison between the most hazardous zones as derived from your study and the intensity of urbanization of Eskişehir city?

References

The paper of Beliceli A. is not in the alphabetical order.

Figure 1

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The upper box reports a blank map. It is useful to add some geographic references.

Figure 2

The Figure is partially blank. It is useful to add the location and the urban layout of Eskişehir city as well as the main cities around it.

References suggested

Castellaro, S., Mulargia F., and Rossi P. M. (2008). Vs30: proxy for seismic amplification? *Seism. Res. Lett.*,79,540–542.

Tosun, H., Seyrek, E., Orhan, A., Savas, H., and Turkoz, M. (2011). Soil liquefaction potential in Eskişehir, NW Turkey, *Nat. Hazards Earth Syst. Sci.*,11, 1071–1082,doi:10.5194/nhess-11-1071-2011

Interactive comment on *Nat. Hazards Earth Syst. Sci. Discuss.*, 2, 6883, 2014.