

Interactive comment on “Damages during February, 6–24 2017 Çanakkale earthquake swarm” by Ramazan Livaoglu et al.

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Response to Dr. Kundak; We would like thank to referee for her valuable comments. According to the Dr Kundak's comments authors tried to improve some part of the study and revised the paper. We believe that most part of the referee's comments were attended and with considerable improvements on the written text. Some revisions are presented in the following pages along with explanations. We have tried our best to accommodate all scholarly comments provided by the reviewer and clarify the ambiguities. We also scrutinized the whole paper to overcome the arisen unclearness through the paper. We hope the revised paper satisfy the standards of your board.

1. General composition: The given theoretical background is quite fragmented. An

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acknowledgement on EQ damage in traditional houses should be given referring past events in both national and international scene. In more detail, a general review of the seismicity of survey region (including consequences of past events) is expected to be given.

Author Reply:

- The introduction of manuscript is rearranged and divided into two sections and new subtitle “Seismicity of the Region” was added to the text.

- EQ damage in traditional buildings is given in damage profile (Section 4) with examples of current earthquake damages (Page 7). Damage types, explained widely in Section 4, already include some damage types of past earthquakes. Thus, authors did not prefer to give them in Introduction.

- As referee commented, the seismicity of the region is added to the manuscript as below in section 2: “In this study, investigated region, north-west Anatolia, as both land and sea, is one of the most important active seismic and deformation region between Eurasian and African tectonic plates. The region is affected from both strike-slip tectonic regime which is a general characteristic of NAFZ and extensional regime of west Anatolian block. The most effective earthquake in instrumental period (after 1900) around the region are Aegean Sea earthquake (M=7.2) occurred in 1981, Ayvacik-Çanakkale earthquake (M=7.0) in 1919 and Edremit gulf earthquake (M=6.8) in 1944.”

2. Presentation of survey area: In the text, authors mentioned about affected villages where I assume that the research has been conducted in. However, it is not clear how many villages have been studied, how many buildings are in those villages and what is the damage ratio in each. It would be better that the authors produce survey area map(s) indicating epicenter, location and damage ratio in those villages. Furthermore, a schematic map might be produced to show PGA distribution. In the text, economic status of residents is mentioned as one of the root causes for damage level (page 7, line 16). If this is a relevant determinant, the authors should give a detailed information

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on socio-economic status of the survey area.

Author Reply:

- The epicenters of earthquakes are given in Fig 1. The locations (latitude and longitude) of those are added to Table 1. PGA of earthquakes are also given in Table 1. Furthermore, a new map including locations of villages, epicenters of earthquakes, their magnitudes and PGAs are added to the manuscript as Figure 9.

- Two different Figures (Figure 10 and 11) are added to manuscript showing number of damaged buildings and damage ratios according to damage level (damaged, slightly damaged, undamaged) for all villages.

- Schematic maps of showing damage distribution for three damage levels are included (Figure 12-13-14)

- In page 7, line 16, Authors mentioned the economic level of survey area as: "Thus, the structural damage was concentrated mainly in the towns which have relatively very low economical level and where there are not any engineered buildings observed by the author."

The low economic level of the area is accepted as a general opinion of Authors at the end of in-situ investigations. Authors think that socio-economic status of the survey area is out of the aim of the paper.

3. Details: The authors should keep in mind that this manuscript addresses to international readers who are not likely familiar with Turkish abbreviations. For instance: AFAD is given in international papers as DEMP (Disaster and Emergency Management Presidency); MTA is MRE (General Directorate of Mineral Research and Exploration). The authors mentioned Turkish Earthquake Code (TEC). The abbreviate name of this reference is Turkish Earthquake Resistant Code and full name is Specification for Building to be built in Seismic Zones (Not disaster zones. According to the Turkish Regulations, once a region is declared as "disaster zone" no building development is permitted, so

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that, logically, it is not possible to have a building codes for new development). In the page 5, line 6, it sounds that the survey area zoning is released in 2007's document. However, the Earthquake Zoning Map of Turkey was produced in 1996. In the page 7, line 23, the year of the reference is not given.

Author Reply:

- The referee's comments on abbreviations to are corrected in the text and references.
- For the full name of Turkish Earthquake Code, Disaster zone term is revised as Seismic Zones.
- In the page 5, line 6, mentioned sentence is revised as: "According to earthquake zoning map of Turkey, prepared by General Directorate of Disaster Affairs in 1996, the seismic zone of the city of Çanakkale is classified as 1, where the probability of exceeding an effective peak ground acceleration of 0.4g is 10 percent in 50 years or the return period is 475 years (TEC 2007)."
- Referee's offer on changing "Turkish Earthquake Code" to "Turkish Earthquake Resistant Code" may be a choice. But "Turkish Earthquake Code" is also commonly preferred in literature. Some of articles are listed below:
 1. Binici, B., Ozcebe, G., & Ozcelik, R. (2007). Analysis and design of FRP composites for seismic retrofit of infill walls in reinforced concrete frames. *Composites Part B: Engineering*, 38(5), 575-583.
 2. Ural, A., Doğanşangün, A., Sezen, H., & Angüsn, Z. (2012). Seismic performance of masonry buildings during the 2007 Bala, Turkey earthquakes. *Natural hazards*, 60(3), 1013-1026.
 3. Altunisik, A. C. and Genç, A. F.: Earthquake Response of Heavily Damaged Historical Masonry Mosques after Restoration, *Nat. Hazards Earth Syst. Sci. Discuss.*, <https://doi.org/10.5194/nhess-2017-141>, 2017 (Accepted paper).

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Thus, Authors prefer to use “Turkish Earthquake Code.” - The year of the reference is added in the page 7, line 23.

4. Conclusion & recommendation: It is very well known that old and low quality (both in material and engineering aspects) buildings are vulnerable to seismic tremors. The recommendations should be beyond re-phrasing "avoid those buildings". Most of the villages are dated back 1970s and before, it is not likely to evaluate them according to the newest building codes. Furthermore, there is always doubt how much they had fit to the old building codes. I suggest authors to focus how traditional rural domestic buildings would be retrofitted using local knowledge and local materials. This approach would give a valuable contribution to the research field.

Author Reply:

- In this study, there were not any evaluation of damaged or collapsed building according to TEC 2007. Authors wanted to emphasize that although max acceleration of occurred earthquakes (Fig.7) is very lower than Response Spectrum of current code (TEC 2007), several buildings have experienced damages and many of them are collapsed.

- As mentioned in conclusion, most of damaged structures in the affected area are constructed with poor workmanship and material quality, construction without any scientific rule or code and lack of tie or connection between structural elements. Hence, retrofitting these damaged structures may not be logical and economic according to authors observations. Furthermore, one or more retrofitting techniques may require for each damage type mentioned in 4th section of the discussion paper. For this reason, authors consider that retrofitting technique should be investigated extensively rather than suggesting these techniques in conclusion. And this case will cause the extension of the paper and is beyond the scope of the paper.

The last version of the manuscript is added in supplement.

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Best regards...

Please also note the supplement to this comment:

<https://www.nat-hazards-earth-syst-sci-discuss.net/nhess-2017-245/nhess-2017-245-AC1-supplement.pdf>

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess-2017-245>, 2017.

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