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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "State of the art of fragility analysis for major building types in China with implications for intensity-PGA relationships" *by* Danhua Xin et al.

Anonymous Referee #1

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The authors of this paper attempted to establish the Chinese fragilities as functions of macro-seismic intensity and PGA by reviewing the past research results. An intensity-PGA relationship is also developed in this study using the fragilities function as a bridge. However, as mentioned in the following specific comments, there are many flaws existed in the utilized methods. The authors misunderstood the concept of macroseismic intensity and are not quite familiar with the intensity evaluation work in China. The corresponding conclusion is not convincing and has limited value in engineering practice. What's more, the studied data and most of the Chinsese references in this article are collected from just one Chinese literature (Ding, 2016; Doctoral thesis.). It is not proper that the authors claimed that they "scrutinize 69 papers. . .".

(1) The macro-seismic intensity is usually evaluated considering the damage situation over the whole city or area, which is influenced by a lot of factors including the local economy level, population and the building types. Same magnitude earthquake events may cause totally different macro-seismic intensity levels in different cities or regions. In China, intensity evaluation work is a complex task requiring experts to adjust to local policies and local economic development levels. Many subjective factors and government policies will significantly affect the final result. However, the fragilities functions are usually used for the vulnerability description of single building or one type of building. So it makes no sense that the authors try to establish some relationship between the macroseismic intensity and the empirical fragility curves for one or two types of buildings in China. Besides that, China had experienced significant economy boost from 1975 to 2014. Therefore the inherent implications of corresponding macroseismic intensity are not the same for earthquakes over such a long time period.

(2) A more detailed earthquake information and post-survey data should be provided for the computation of the following empirical fragilities curves. (Page 5:Line 10-40) The data download link provided by author is not valid either(Page 5:Line 27) . Please update the website link and keep it accessible which is quite important for your article. Followings are some key questions we think are ignored by the authors: 1. (Page 5:Line 20-25) How to classify the buildings into different levels and extract the corresponding damage data just from the descriptions in the reference articles? The economy and development level of different provinces in China are quite unbalanced especially considering the long time period (over 40 years). How to recognize the "building construction age and corresponding code level" for a specific earthquake event? 2. (Page 5:Line 15-20) As mentioned in the paper, Stone as well as chuandou-timber structures are typical building types in mountainous area of Tibetan, Qinghai and Sichuan with frequent earthquake as indicated in the Table 5-2 in the Ding (2016). Please explain why this kind of buildings are not included and discussed in the paper. They all contribute to the final macroseismic intensity evaluation results. 3. (Page 5:Line 17) Please explain why the authors did not use the Type A, B, C building as defined in the Chinese seis-

mic intensity standards (GB17742-2008). What survey data could support the point of "two most widely distributed building types in China: masonry and RC buildings" ? 4. (Page 5:Line 10) Please provide detailed 112 earthquake events information used in this article. After careful references check by reviewer, some of the damage situations data or ratios in the reference articles are the roughly estimation by different authors themselves. The criterions and results are actually quite subjective and different even for the same earthquake event. The number of destructive earthquake events (112) used in this article is identical with the data mentioned in the Ding's Graduate Thesis (2016). The author should consider doing some further reference proofread work.

(3) Using the fragilities function as the bridge to derive the relationship between the macroseismic intensity and PGA neglect the uncertainties in many aspects: structural, earthquake, fragility computation methods and the data source mentioned in previous comments. Just by removing the outlier and doing some variance analysis are not enough to solve the problem of uncertainty transmission. What's more, considering that the referenced data are basically similar with the Ding (2016) and Ding (2017), there is no point that the authors compared the intensity-PGA relationship results with Ding.Besides that, only the results of the mean PGA-intensity relationship derived based on fragilities of "masonry_A" is provided in Table.5. The results of the "masonry_B" and "RC_A/B" are missing due to unknown reason.

Technical Corrections: Page 17. The Fig.1 and related content in article is not necessary. The mentioned calculation methods of analytical fragility curves and damage probability matrices are actually not carried out in this article. Page 31. Line 10. The PGA range is not the same with the table in reference Ding, 2017. Page 5. Line 15. "chuandou-timber" is not properly translated.

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