

The authors are grateful to the time spent by Prof. Mustafa Erdik (hereafter referred to as “RC1”) on carefully reading our work and giving a series of constructive comments. Detailed responses to these comments are given as follows. *The comments are in purple with italic font* and *our responses are in blue*.

(i) General comments from RC1:

“The paper essentially aims the development of intensity-PGA relationships using a novel method that relies on comparison of intensity-based empirical and PGA-based analytical fragility relationships for the same building types from China. To fulfill this object, the authors first review the empirical building fragility database, mostly for China, scrutinize the data and derive the median Chinese intensity-based fragility relationships with basic treatment of uncertainties. For this empirical fragility study, three types of masonry buildings with different construction practices are considered. Secondly, the authors inspected publications that provide PGA-based analytical fragility functions (dependent on PGA) for the same damage classes and building categories. Thus, a solid fragility database and median fragility relationships, based on both intensity and PGA, are established for mainland China. For the derivation of median fragility relationships, the lognormal distribution is used with excellent goodness of fit. The paper culminates with the description and application of the novel approach for the development of the intensity-PGA relation by using fragility as the transfer medium. The results obtained are very valuable and compare well with limited relationships based on direct regression of measured PGA with the assessed intensity values. “

(ii) Response:

Thank you for this summarization and such positive judgement on our work.

(i) RC1 comment 1:

“Very comprehensive literature review and description of ingredients and methodology on the assessment of fragility relationships from empirical data.”

(ii) Response: Thank you for saying so.

(i) RC1 comment 2:

“ Text can be shortened since involves several repetitions of the objectives and methodologies.”

(ii) Response: From the feedbacks of previous reviewing process, some reviewers misunderstood or partially neglected the focuses of this work. Therefore, although the objectives and methodologies are firstly mentioned in the Introduction section, to emphasize and to avoid possible misunderstanding from future readers, the focuses are thus reiterated in Section 4 and Section 5.2.

(i) RC1 comment 3:

“With the exception of the information provided on general approaches on the derivation of analytical vulnerabilities, not much detail is provided on the papers that the PGA-based analytical fragilities for the Chinese building stock. It appears that, with the exception of outlier removal, results on all these papers are given the same weight for the median fragility assessment. “

(ii) Response: The analytical fragility related studies for the Chinese building stock generally follow the classical methods and procedures as summarized in Page 4 Line27-36. Therefore, the details of these procedures are not presented in detail, since there is marginal exception.

You are right in that we do give the same weight for different intensity/PGA levels in regressing the median fragility curves, to avoid the introducing of extra subjective uncertainty. Since we noticed in previous literature, some researchers gave higher weight to lower intensity/PGA levels (e.g. Ding et al., 2017) in their regression, while others gave higher weight to higher intensity/PGA levels (e.g. Ma et al., 2014) with different focuses.

(i) RC1 comment 4:

“The uncertainties in the fragility assessments are not adequately covered in the paper with the exception of uncertainties illustrated in Appendix Fig. A1-A4 and Table B1).”

(ii) Response: Thank you for pointing this out. RC2 also gives a detailed suggestion in regard of this. We’ll accept the suggestions of you two and combine the error-bar analysis in the Appendix Fig. A1 and Fig. A2 with the median fragility curve in Fig. 7 and Fig. 8 in the main context, respectively.

(i) RC1 comment 5:

“Direct comparison of different fragility relationships is a difficult issue due to different building, damage state and ground motion intensity definitions and attributes considered in these relationships. This fact also manifests itself in this paper. Upon comparison of fragility relationships obtained in this paper with the results of several relevant international projects, only one (HAZUS Project) similarity for “Masonry – A” building type was found.”

(ii) Response: Yes, this part was added to respond the comments of one previous reviewer. And we do notice the difficulty to conduct such comparisons, given the differences you summarized in the comment among different international projects. Such a grand topic deserves individual deep-going study in the future. Therefore, to keep the integrity and narrow down the focus of our current work, we’ll remove the comparisons in Section 4.2 and delete the related descriptions in and main context as well as figures in the Appendix part.

(i) RC1 comment 6:

“The intensity-PGA relationships developed by using the correspondence between the empirical and PGA-based analytical fragility relationships is based on a novel approach and would be very valuable for use in international projects. However, a description on the relationship between the Chinese Official Seismic Intensity Scale (GB17742) and the other internationally adopted scales (e.g. MMI, MSK, EMS) may need to be included (or referenced) in the paper.”

(ii) Response: Thank you for this suggestion. We found in previous studies (e.g. in Daniell, 2014) such work has been conducted. We’ll add these references in the main context of the revised version.

	Rossi-Forel-1883	Mercalli-1902	MCS-1923	MWN-1931	MCS-1942	JMA-1951	GEOF/IAN-1953	MM-1956	EMI-1969	MSK-1964	Liedu-1980/1999	MMSK-1992	JMA-1996	EMS-1998	PEIS-1999	CWB-2000
I	I	II	I	I	0	I	I	I	I	I	I	0	I	I	0	
II	II	III	II	II	I	II	II	II	II	II	II	I	II	II	I	
III	III	IV	III	III	II	III	III	III	III	III	III	II	III	III	II	
IV	IV	V	IV	IV	III	IV	IV	IV	IV	IV	IV	III	IV	IV	III	
V	V	VI	V	V	III	V	V	V	V	V	V	II	V	V	IV	
VI	VI	VII	VI	VI	IV	VI	VI	VI	VI	VI	VI	II	VI	VI	IV	
VII	VII	VIII	VII	VII	IV	VII	VII	VII	VII	VII	VII	III	VII	VII	V	
VIII	VIII	IX	VIII	VIII	V	VIII	VIII	VIII	VIII	VIII	VIII	III	VIII	VIII	VI	
IX	IX	X	IX	IX	VI	IX	IX	IX	IX	IX	IX	IV	IX	IX	VI	
X	X	XI	X	X	VI	X	X	X	X	X	X	V	X	X	VI	
		XII	XI	XI	VII	XI	XI	XI	XI	XI	XI	VI(U)	XI	XI	VII	
			XII	XII		XII	XII	XII	XII	XII	XII	VII	XII	X		

Figure R1: Comparison of Intensity Scales in Daniell (2014, in his Figure 9), after the work of Gorshkov and Shenkareva (1960), Barosh (1969), Musson et al. (2010) (Note: in this figure, “Liedu-1980/1999” represents the Chinese Seismic Intensity Scale).

(i) RC1 comment 7:

“The methodology in the transmission of uncertainty from empirical/analytical fragility database to the intensity-PGA relation is provided in Appendix C. This transmission of uncertainty is important and should preferably be integrated into the main text of the paper.”

(ii) Response: Thank you for this suggestion. But since the uncertainty of this newly derived intensity-PGA relationship is mentioned only as a number in Section 5.4, to keep the structure of this work clear and also to narrow down the focus, we still consider that it is better to put the uncertainty transmission methodology in the Appendix part for interested readers to have a further check.

References:

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