RED-ACT Report

Real-time Earthquake Damage Assessment using City-scale Time-history analysis

Aug. 04, M6.2 Japan Fukushima-ken Earthquake

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Acknowledgments and Disclaimer

The authors are grateful for the data provided by K-NET and KiK-net. This analysis is for research only. The actual damage resulting from the earthquake should be determined according to the site investigation.

Scientific background of this report can be found at:

http://www.luxinzheng.net/rr.htm

1. Introduction to the earthquake event

At 19:23 04 Aug 2019 (Local Time, UTC +9), an M 6.2 (JMA) earthquake occurred in Japan Fukushima-ken. The epicenter was located at 141.7 37.7, with a depth of 50.0 km.

2. Recorded ground motions

20 ground motions near to epicenter of this earthquake were analyzed. The names and locations of the stations can be found Table 1. The maximal recorded peak ground acceleration (PGA) is 175 cm/s/s. The corresponding response spectra in comparison with the design spectra specified in the Chinese Code for Seismic Design of Buildings are shown in Figure 1.

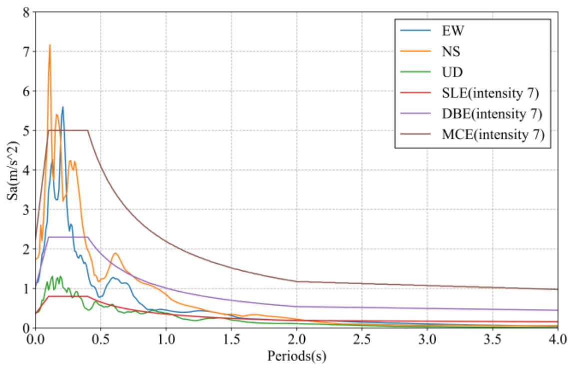


Figure 1 Response spectra of the recorded ground motions with maximal PGA

3. Damage analysis of the target region subjected to the recorded ground motions

Using the real-time ground motions obtained from the strong motion networks and the **city-scale nonlinear time-history analysis,** the damage ratios of buildings located in different places can be obtained. The building damage distribution and the human feeling distribution near to different stations are shown in Figure 2 and Figure 3, respectively. These outcomes can provide a reference for post-earthquake rescue work.

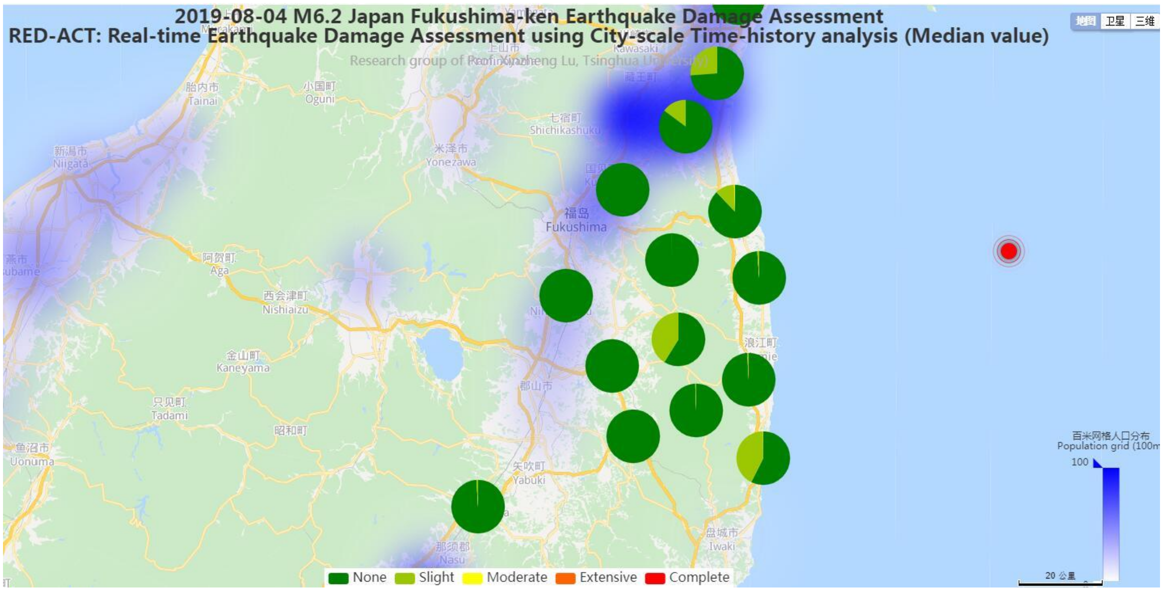


Figure 2 Damage ratio distribution of the buildings near to different stations

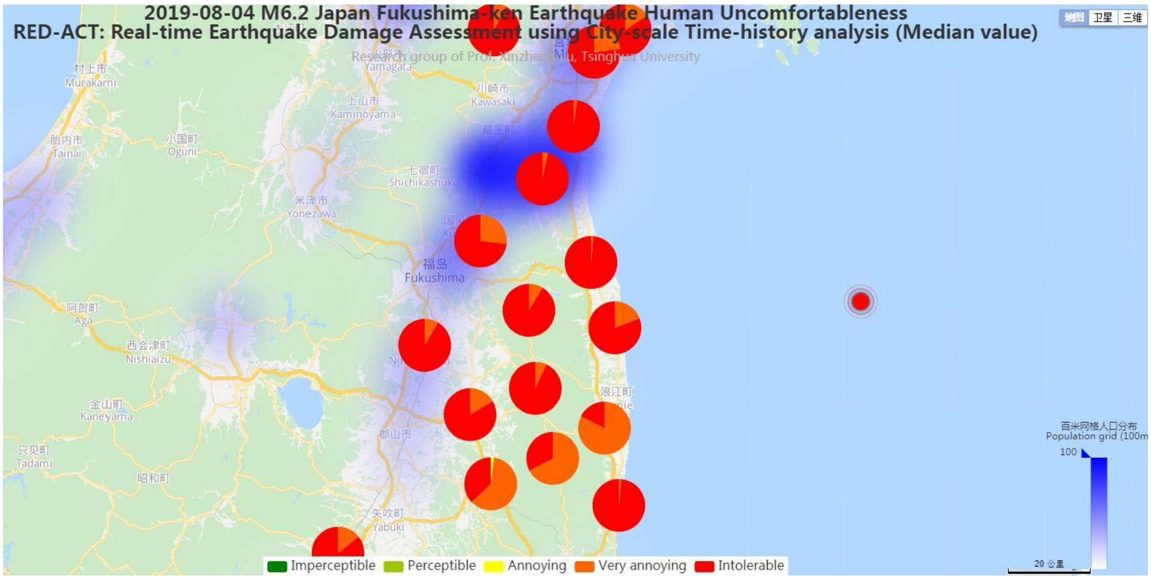
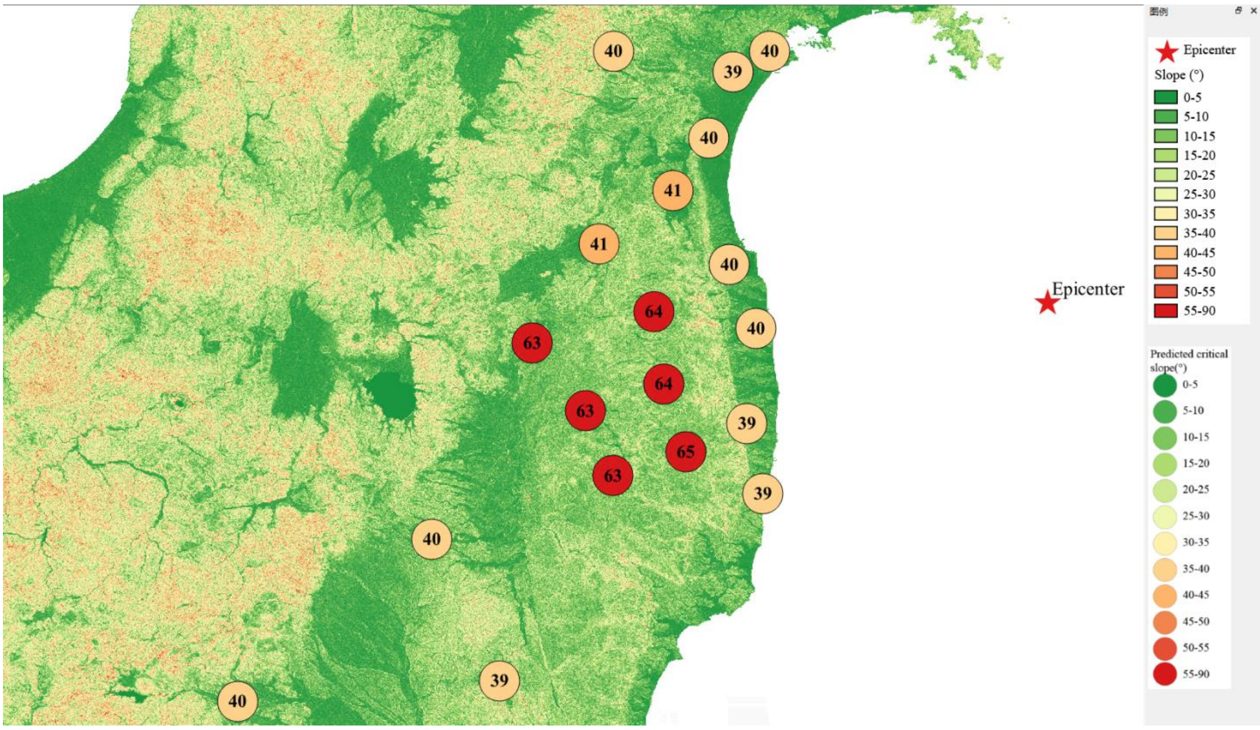


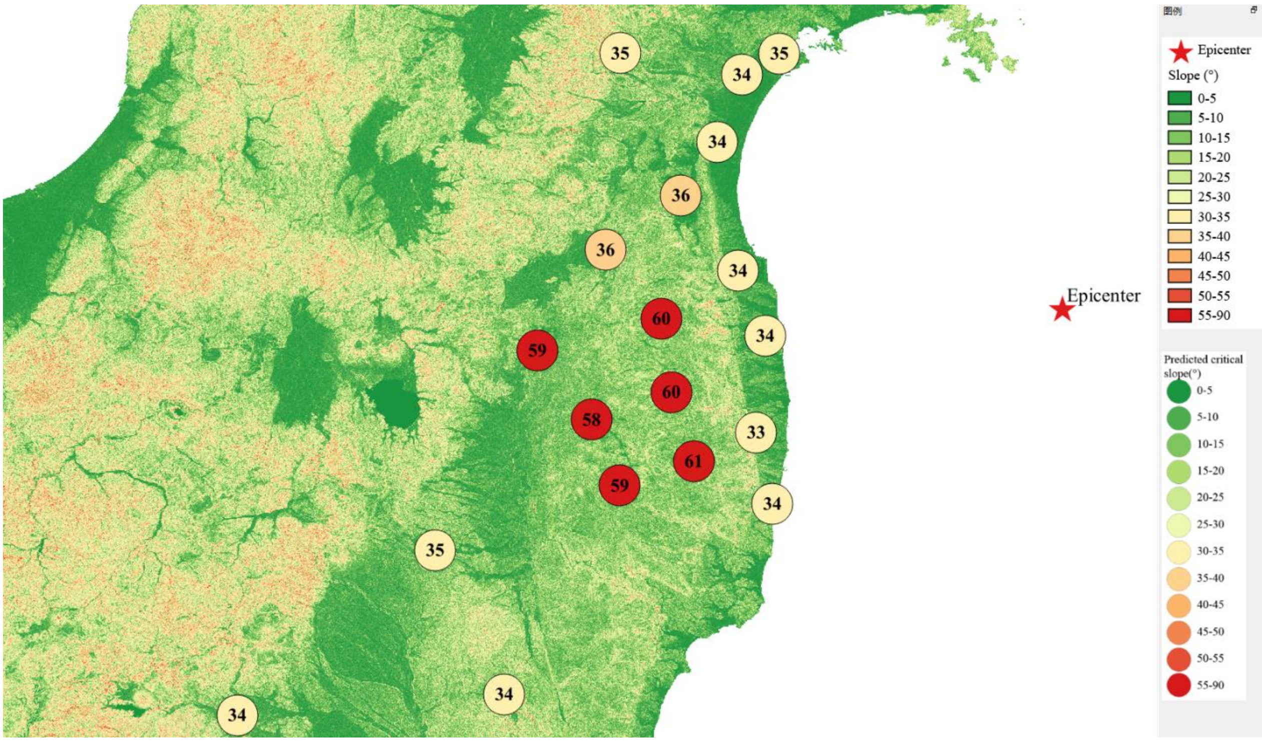
Figure 3 Human feeling distribution near to different stations

4. Earthquake-induced landslide of the target region subjected to the recorded ground motions

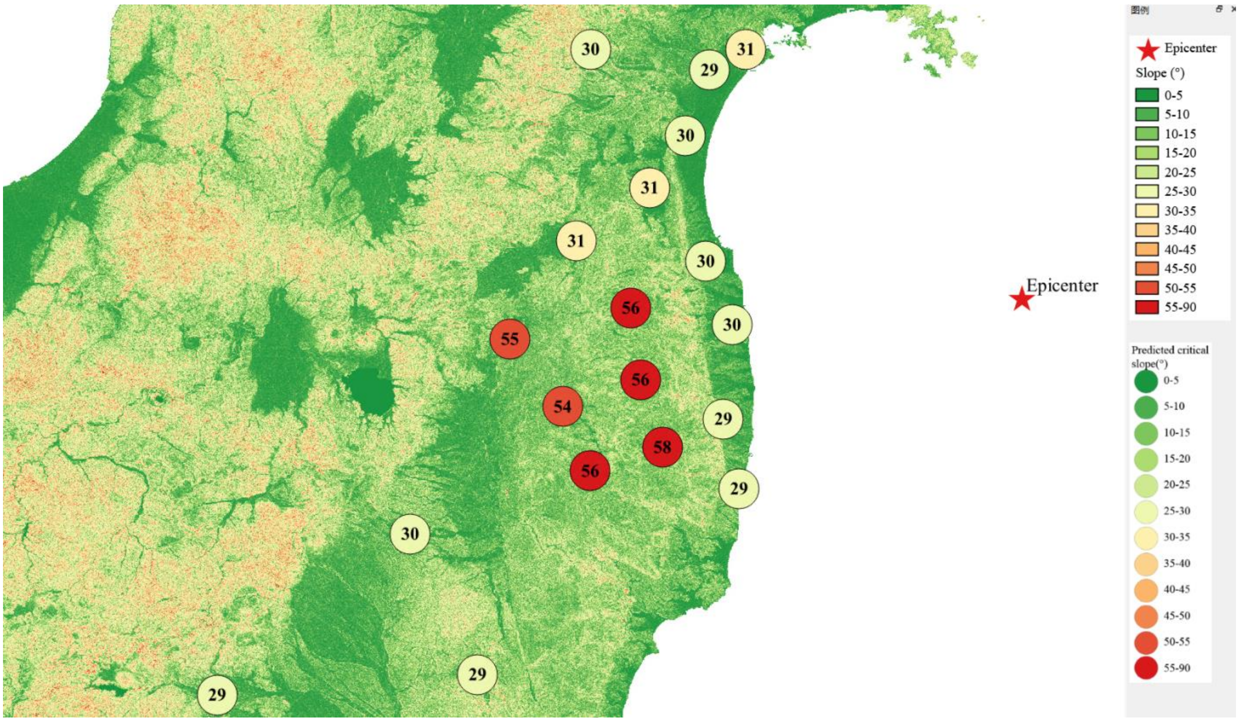
According to local topographic data, lithology data and ground motion records, the distribution of earthquake-induced landslide near to different stations under the different proportions of the landslide slab thickness that is saturated can be calculated, as shown in Figure 4. The basemap shows the distribution of the local slope. The number in the circle represents the critical slope of the landslide. The earthquake-induced landslide tends to occur with a higher probability when the slope near the station is larger than this threshold value.



(a) The proportion of the landslide slab thickness that is saturated equals 0%



(b) The proportion of the landslide slab thickness that is saturated equals 50%



(c) The proportion of the landslide slab thickness that is saturated equals 90%

Figure 4 Distribution of earthquake-induced landslide near to different stations

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Table 1 Names and locations of the strong motion stations

No.	Station Name	Longitude	Latitude
1	FKS001	140.92	37.7949
2	FKS002	140.601	37.8449
3	FKS004	140.735	37.6799
4	FKS005	140.985	37.6385
5	FKS006	140.759	37.5031
6	FKS007	140.963	37.4061
7	FKS008	140.567	37.4363
8	FKS009	140.635	37.2778
9	FKS010	141.002	37.2342
10	FKS016	140.191	37.1228
11	FKS019	140.437	37.603
12	FKS031	140.813	37.3364
13	IBR001	140.357	36.7761
14	MYG012	141.019	38.3175
15	MYG013	140.929	38.2663
16	MYG014	140.636	38.3177
17	MYG015	140.87	38.1049
18	MYG017	140.782	37.9763

19	TCG009	139.715	36.7258
20	TCG014	140.174	36.545