RED-ACT Report

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

Jun. 17, M6.0 Changning County, Sichuan Province Earthquake

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Acknowledgments and Disclaimer

The authors are grateful for the data provided by China Earthquake Network Center (CENC). 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/software/Real-Time_Report.pdf

1. Introduction to the earthquake event

At 22:55 Jun 17 2019 (Local Time, UTC +8), an M 6.0 earthquake occurred in Changning County, Sichuan Province. The epicenter was located at 104.90 28.34, with a depth of 16.0 km.

2. Recorded ground motions

23 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 **611** 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.

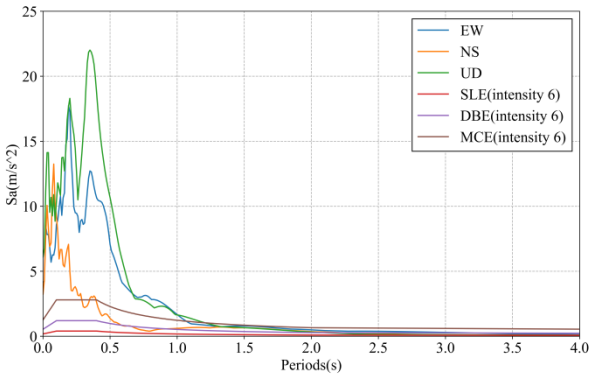


Figure 1 Response spectra of the recorded ground motions with maximal PGA

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 (see the Appendix of this report),** the damage ratios of buildings located in different places can be obtained. The building damage distribution and the human uncomfortableness distribution near to different stations is shown in Figure 2 and Figure 3, respectively. These outcomes can provide a reference for post-earthquake rescue work.

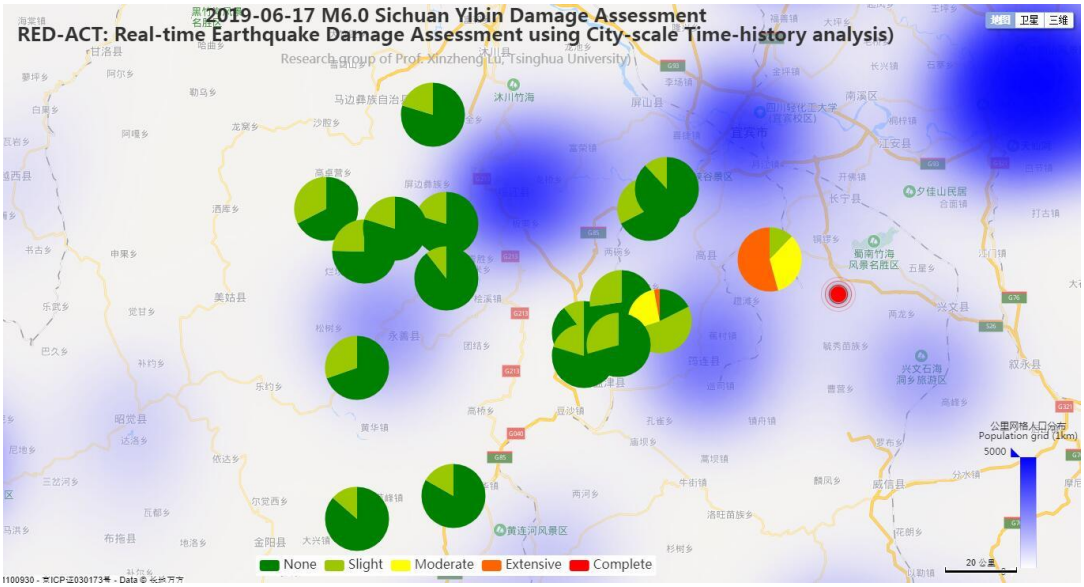


Figure 2 Damage ratio distribution of the buildings near to different stations

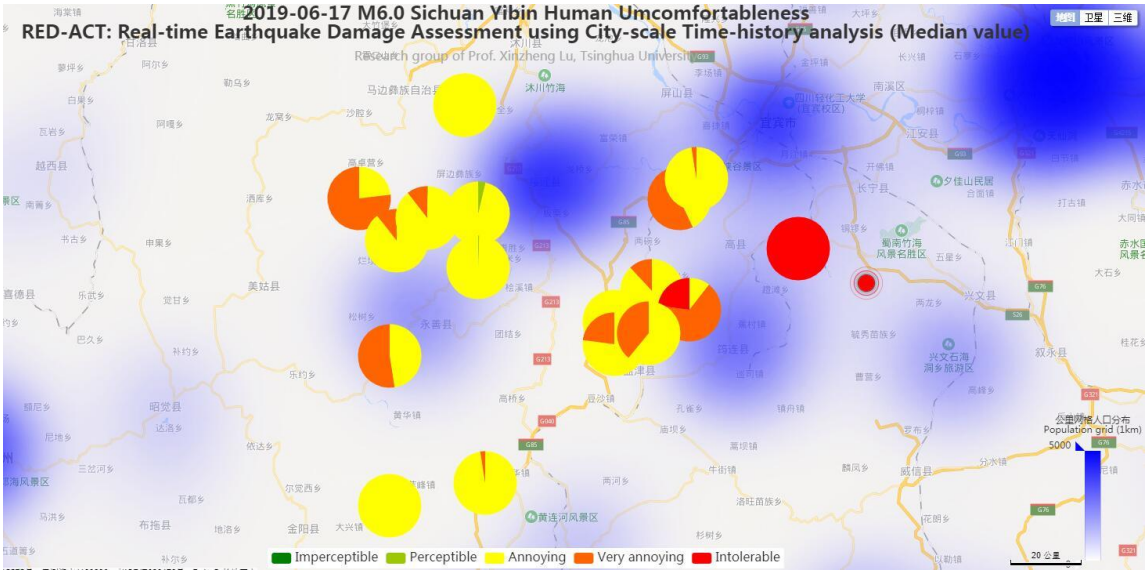
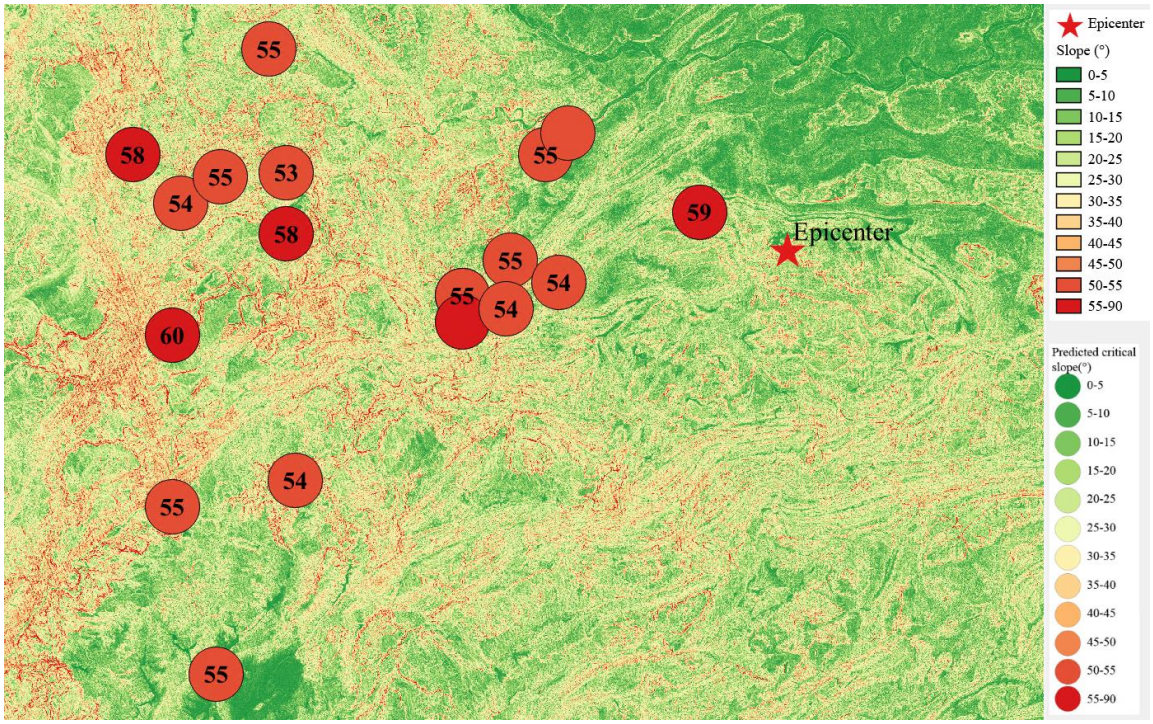


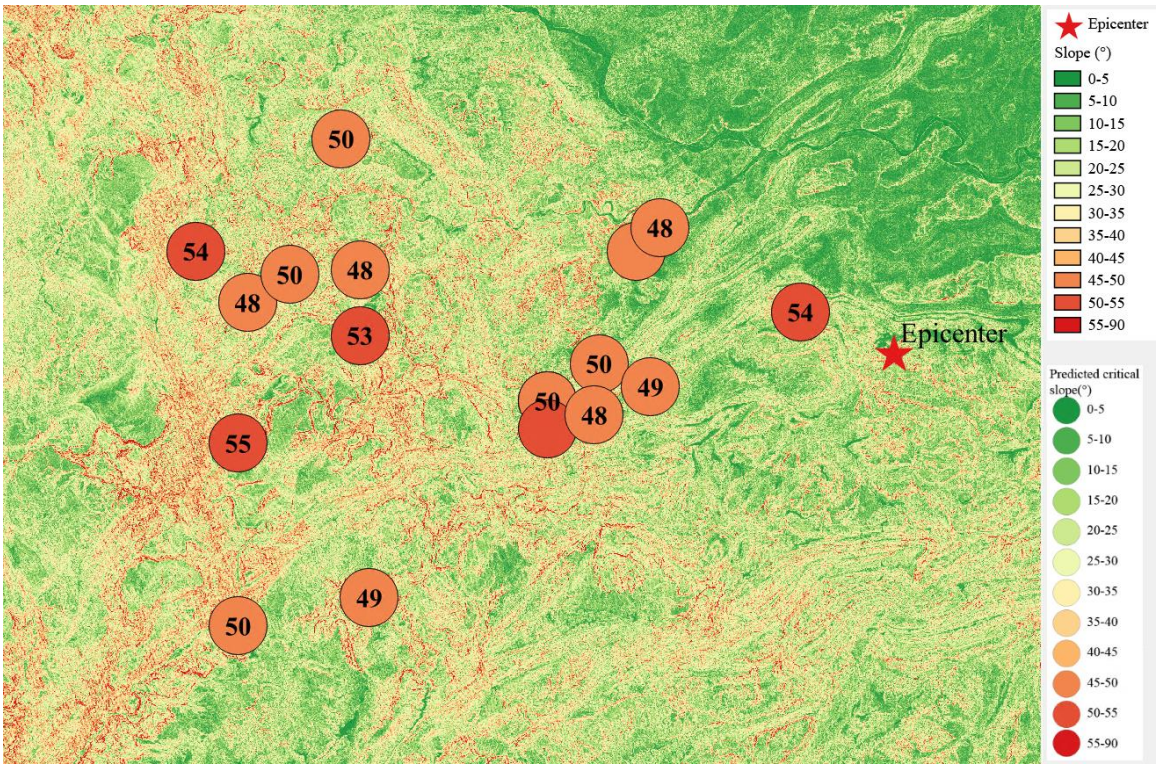
Figure 3 Human uncomfortableness distribution near to different stations

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

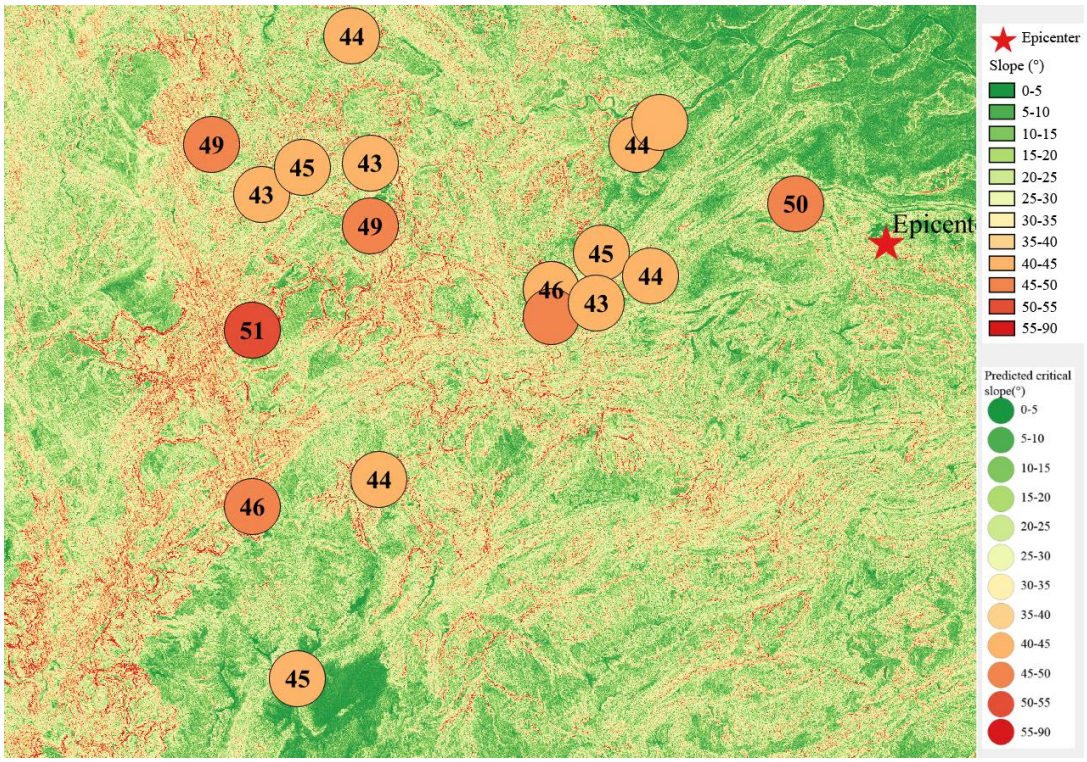
According to local topographic data, lithology data and ground motion records, the distribution of earthquake-induced landslide near to different stations under the different proportions of the landslide slab thickness that is saturated can be calculated, as shown in Figure 4. The basemap shows the distribution 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 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	L3301	103.72	28.8
2	L3304	103.41	28.56
3	W3702	103.76	28.52
4	W3703	103.52	28.45
5	W3707	103.76	28.38
6	W3709	103.5	28.15
7	W3713	103.61	28.51
8	C0206	103.6	27.38
9	C0207	103.71	27.21
10	C2301	104.16	28.24
11	C2303	104.16	28.18
12	C2308	104.27	28.32
13	C2309	104.38	28.27
14	C2311	104.26	28.21
15	C2406	103.78	27.82
16	C2505	103.5	27.76

17	C3003	104.35	28.56
18	C3004	104.4	28.61
19	51FSB	104.79	29.12
20	51YBG	4.4	28.8
21	51YBT	104.57	28.71
22	51YBY	104.56	29.02
23	51GXT	104.70	28.43