RED-ACT Report

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

Feb. 21, M5.1 Xinjiang Jiashi 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/rr.htm

1. Introduction to the earthquake event

At 23:39 Feb. 21 2020 (Local Time, UTC +8), an M 5.9 earthquake occurred in Jiashi, Xinjiang. The epicenter was located at 39.87 77.47, with a depth of 10 km.

2. Recorded ground motions

22 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 **229.8** cm/s/s. The waveform and corresponding response spectra in comparison with the design spectra specified in the Chinese Code for Seismic Design of Buildings are shown in Figure 1.

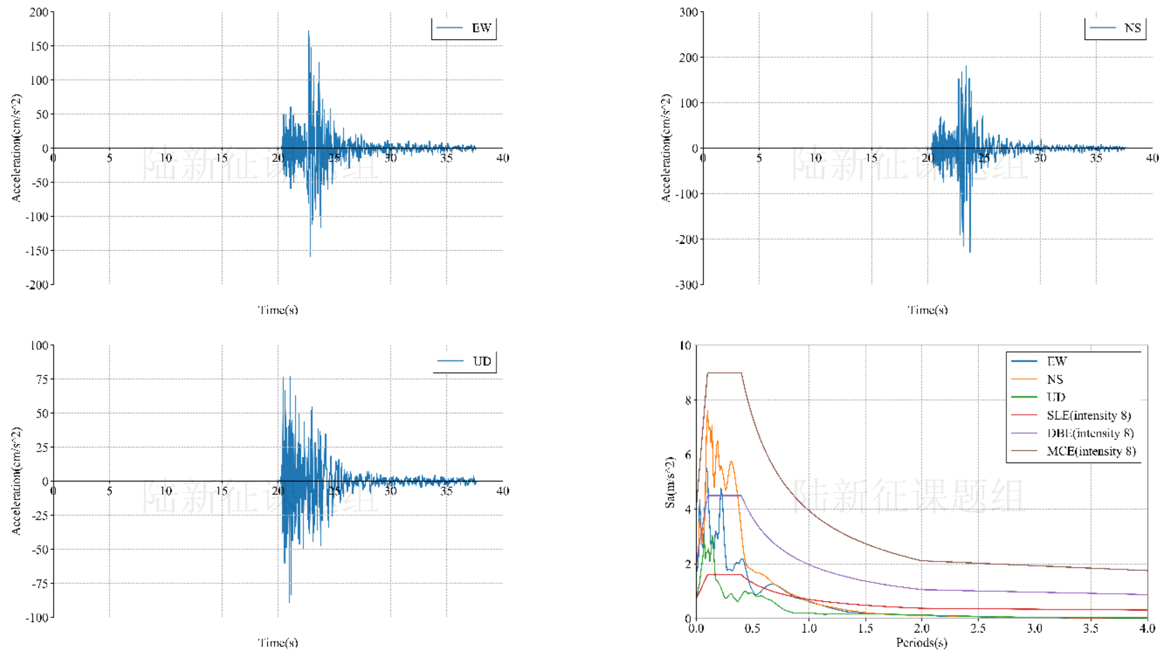


Figure 1 Waveform and response spectra of the recorded ground motions with maximal destructive capacity

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

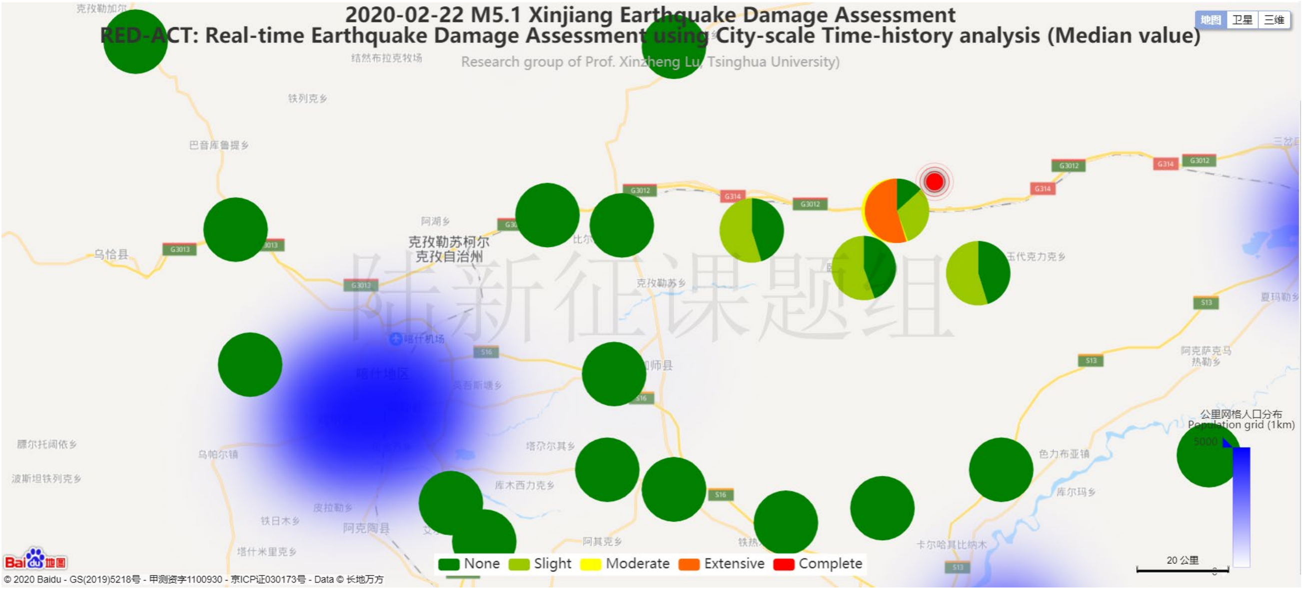


Figure 2 Damage ratio distribution of the buildings near to different stations

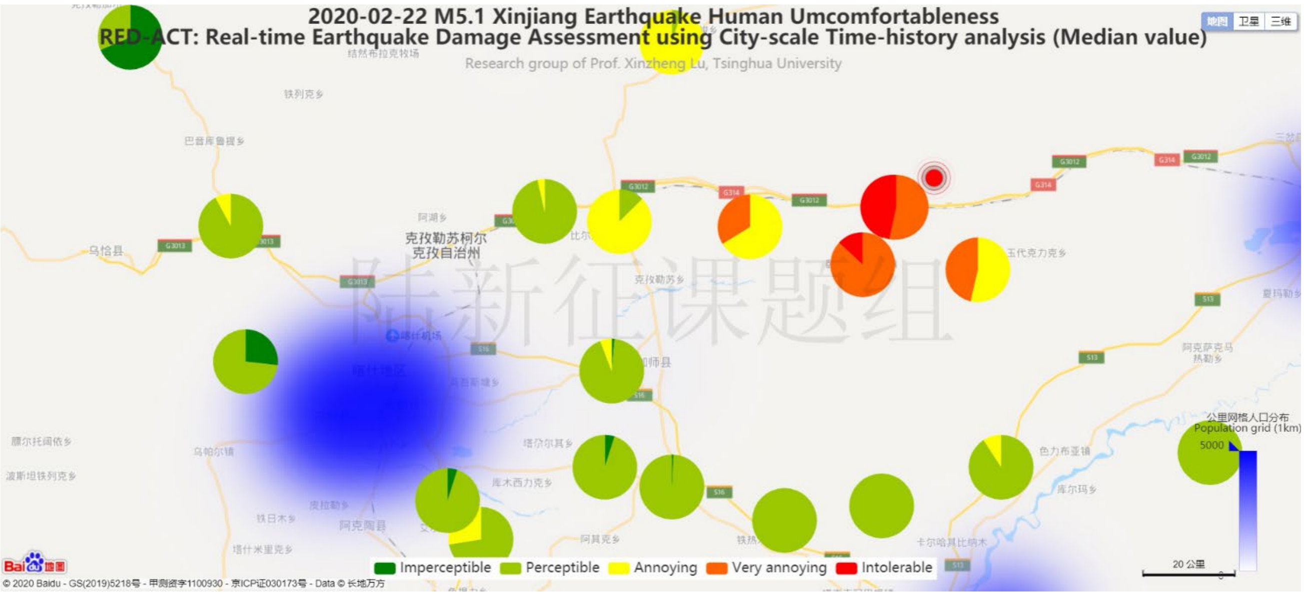
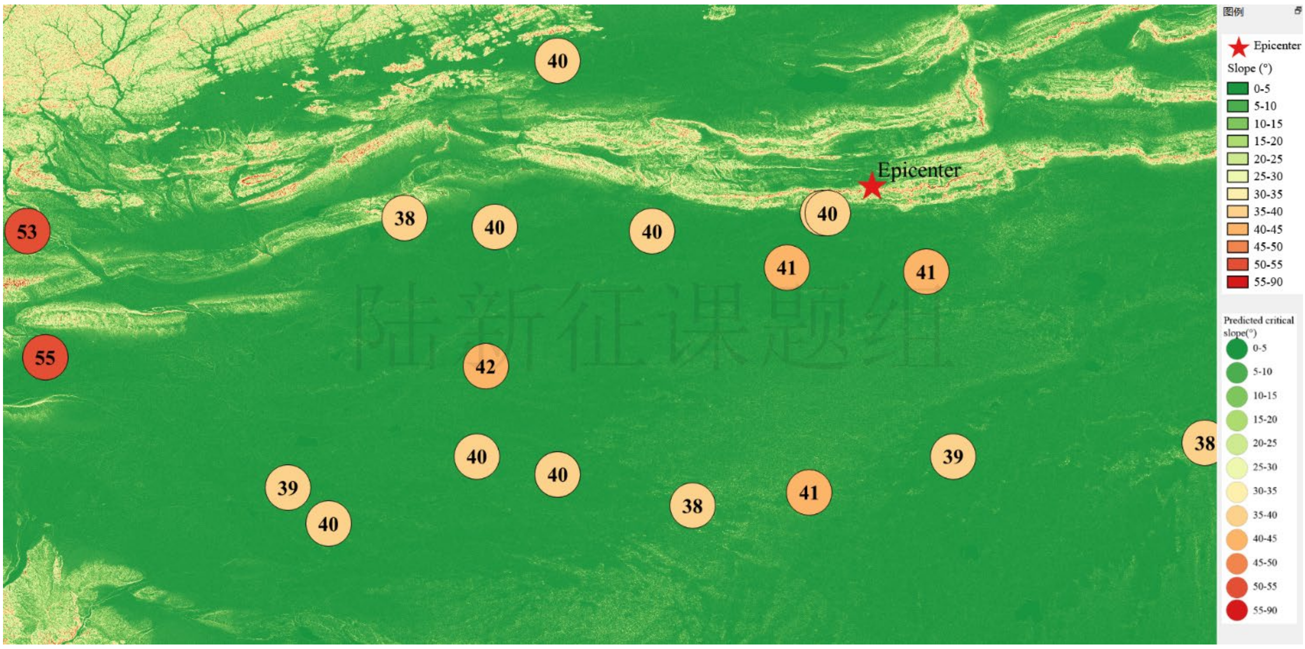


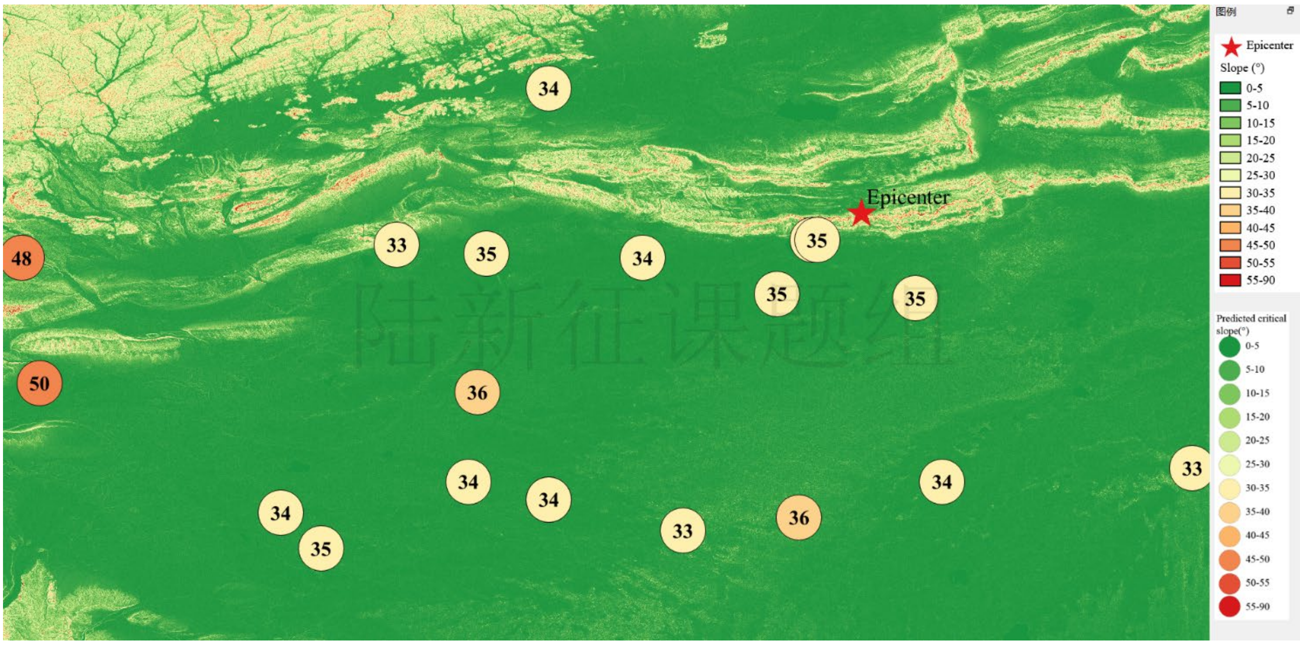
Figure 3 Human feeling distribution near to different stations

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

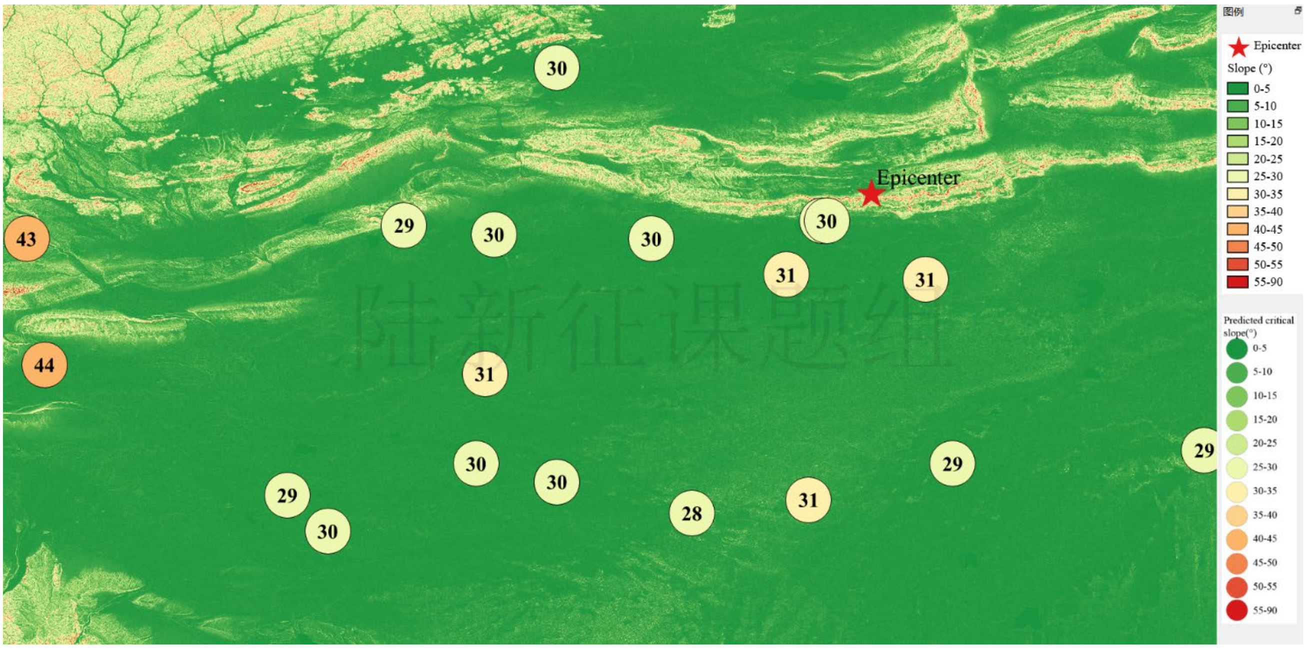
According to local topographic data, lithology data and ground motion records, the distribution of earthquake-induced landslide near to different stations under the different proportions of the landslide slab thickness that is saturated can be calculated, as shown in Figure 4. The basemap shows the distribution 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 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	65ALL	76.26	39.12
2	65ALM	77.33	39.19
3	65GDL	76.63	39.78
4	65GLK	76.98	39.77
5	65HLJ	76.77	40.15
6	65HLK	86.12	41.76
7	65HQC	76.43	39.8
8	65JAS	76.77	39.23
9	65JZC	77.59	39.68
10	65LD1	77.36	39.81
11	65MLA	78.21	39.30
12	65MUS	75.63	39.49
13	65QQK	77.65	39.27
14	65SRT	77.07	39.16
15	65TOY	75.32	40.16
16	65TPA	75.59	39.77
17	65WLG	77.28	39.69
18	65XKR	77.37	39.81
19	65XTL	76.61	39.47
20	65YBZ	76.59	39.27
21	65YPH	76.77	39.23

22	65YPQ	76.17	39.20