

Relationships between building damage and characteristics of strong ground motions during the M6.5 Zhaotong Earthquake-I

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Magnitude 6.5 inland earthquake happened at the Longtoushan town which is located on the northeast side of the Yunnan province of China on 16:30 August 3rd, 2014 (CST). The biggest seismic intensity is estimated to be IX in China seismic intensity scale (equal to 5+ in JMA seismic intensity scale) at the Longtoushan town with the recorded peak ground acceleration (PGA) of 949 gal. As of 8 August 2014, 617 persons were killed by this earthquake, in which almost 85% (526 persons) of the death are happened at the Longtoushan town. The reason of death should be attributed to the seismic capability of residential houses and the characteristics of ground strong motions.

In order to make clear the building damage condition and the ground amplitude and period characteristics, we performed the onsite investigation of building damage and the microtremor measurement from November 9th ~12th, 2014. The places which have been investigated are marked with red dots in Fig 1. The PGA of investigated places are, 15 gal at Zhaotong city, 45 gal at Ciyuan town, 137 gal at Qianchang, and 135 gal at Mashu town. Based on the attenuation relations of PGA, it has been known that the accelerations attenuated fast with the increasing of fault shortest distance.

Masonry houses and buildings are commonly used in the disaster area. In the Longtoushan town, the collapse of masonry buildings can be widely seen. Based on the vulnerability functions of the 2008 Wenchuan earthquake, which was proposed by Wang 2011, the predicted collapse ratio of the Longtoushan town is 79%, which is almost the same with the result of onsite investigation. However, the building collapse cannot be seen in other places. Some slight damage, such as the crack in masonry walls, can be seen in the Qianchan town and Mashu town. Generally, no damage happened to buildings in the Zhaotong city.

We measured the ground microtremor of these onsite investigated places using high-sensitive velocity seismometers with sampling rate of 100 Hz and duration of 30 min in each place. Based on the H/V spectra, the predominant period of Longtoushan is about 4 Hz which is almost the same with results of other places. Furthermore, it has been known that the building damage in Longtoushan town relates to the ground condition of mountain side and the river side.

Keywords: Zhaotong Earthquake, Onsite Investigation, Ground Microtremor Measurement, Masonry Buildings

