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Relationships between building damage and strong ground motions characteristics during the 2014 Zhaotong Earthquake-III

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Many of the buildings near the Longtoushan (LTS) strong-motion station were heavily damaged or collapsed during the 2014 Zhaotong earthquake (Ms 6.5) which occurred on Aug. 3, 2014. The largest PGA with approximately 1 g was recorded at LTS during the mainshock. In contrast, the damage of buildings was minor near other stations, and the strong-motion records there were lower than 150 gal.

We conducted an almost three-day field survey near five strong-motion stations around the epicenter. We found that the causes for heavy damage of buildings near the LTS station were complicated, such as geological failure (e.g. landslide), insufficiently seismic resistant structural design, inappropriate construction, and site effect (transfer function and nonlinear effect), and so on. We also found that the collapse of many buildings in the EW direction was obviously heavier than that in the NS direction near the LTS station. It can be explained by the higher pseudo-velocity response spectrum in the range of 0.5 s to 1.0 s in the EW direction.

We also conducted microtremor measurement at six sites around the LTS station to examine the variation of site effects in this area. We found that the predominant periods at heavily damaged sites were similar, i.e., 0.25 s, while the predominant periods at light damaged sites were about 0.15 s.

In addition, we obtained several aftershock records as well as mainshock record, and the boring data near the LTS station. These data can be used to clarify the site effect characteristic at the LTS station.

Keywords: Zhaotong Earthquake, ground motion, microtremor, site effect