Mapping coseismic landslide damaged buildings during the 2008 Wenchuan Earthquake in rural mountainous area

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ABSTRACT: Determining the location of coseismic landslides damaged buildings is critical to the understanding of human losses from earthquake-induced landslides during major earthquakes in mountainous regions. Because of the vast area of the earthquake affected region and the sparse locations of rural settlements, previous knowledge on buildings and human losses resulting from coseismic landslides mainly rely on rough estimations from limited field work. Application of high resolution satellite remote sensing opens a new way to map pre-seismic rural mountainous housing over large areas, and thus can accurately determine the location of coseismic landslide damaged housing spatially. In this work, we used the 2008 Wenchuan Earthquake as an example and use SPOT5 images taken before the earthquake for a seimi-automated mapping of buildings in rural areas. Then, by spatial overlay analysis with an existing coseismic landslide inventory, we mapped the location of landslide damaged buildings in this area. This semi-automatic method can be further applied to the entire Wenchuan Earthquake affected region to determine the locations of all landslides damaged buildings and finally improve the performance of earthquake loss estimation models.

1 INTRODUCTION

China is one of the most severely affected countries by landslides in the world (Nadim, Kjekstad et al. 2006; Kirschbaum, Adler et al. 2010; Petley 2012). Landslides in China are often triggered by rainfall and earthquakes, and are mainly concentrated in Sichuan, Yunnan and Gansu Provinces. Losses from coseismic landslides usually contribute a large portion of direct losses from earthquake in mountains regions (Budimir, Atkinson et al. 2014).

For regional coseismic landslide studies, most works have been conducted in the following aspects of landslide hazard analysis (Fell, Corominas et al. 2008; Wasowski, Keefer et al. 2011): landslide inventory regarding the measurement of different intensities of landslides, and 3) determining the number of casualties resulting from the landslides as part of the total number of casualties (Van Westen, Van Asch et al. 2006).

Pre-earthquake rural buildings are regarded as an important proxy for population and other exposure distribution in coseismic landslide disaster studies. Therefore, using remote sensing images to map building distribution plays a fundamental role in estimating damages caused by coseismic landslides.

1.1 Medium resolution remote sensing

With a spatial resolution of 30-m, Landsat data is the most frequently used data to map land cover type