



Strong Motion, Damage, and Loss of Wenchuan Earthquake

Zifa Wang

Professor, Institute of Engineering Mechanics, China Earthquake Administration, Harbin, China

Email: zifa@iem.ac.cn

ABSTRACT: The May 12, 2008 Great Wenchuan Earthquake has resulted in close to 70,000 deaths with more than 17,000 still missing and a loss in the hundreds of billions RMB. Immediately after the earthquake, China Earthquake Administration (CEA) responded quickly by sending teams of experts to the affected region, eventually including over 60 staff members from the Institute of Engineering Mechanics (IEM) for emergency response, search and rescue as well as loss estimation efforts. IEM also quickly teamed up with RMS, Inc. on estimating the casualty and direct building loss a few hours after the occurrence of the Earthquake. The estimates were relayed to the frontline of the search and rescue efforts and helped the government decide on mobilizing additional large teams of troops and professional personnel to the affected area. A couple of months later, CEA sent in another team to further investigate on the loss and damage of the earthquake, including 50 staff again from IEM. The newly completed national digital observation network for strong motion recorded the Earthquake at more than 400 stations, accumulated a vast amount of data for future earthquake engineering researches. This paper intends to report on the preliminary information that has been gathered so far and the limited analysis performed until recently, particularly on strong motion, damage and loss of the Earthquake. The initial analysis of the observed ground motion has revealed that there are a few new-fault stations which have larger vertical peak values than the horizontal ones and there are a few stations with very long duration. The dominant frequency for the ground motion concentrates in the 1-5 frequency range, which is relatively high for an event with a magnitude of 8. This is probably the main reason why the ground motion attenuated very rapidly which confined the heavy damage to a very long but narrow stripe. Many types of engineering structures suffered heavy damage in the central area, but there are a few buildings that performed very well, even at places only a few meters away from the rupture. This gives us hope in building future engineering structures with proper earthquake resistance. There was also widespread geotechnical failure, which not only destroyed the buildings, roads and bridges, but also delayed fast response and emergency relief efforts. The quick loss estimation is essential for effective search and rescue efforts, particularly for M8 class earthquakes in remote areas where access is difficult and communication is not well established. Finally the author listed a few items for discussion which are potentially also the lessons we should learn from such a disastrous earthquake event.

KEYWORDS: Wenchuan Earthquake, field investigation, ground motion, earthquake loss, earthquake damage