



Geologic structures contributing to the catastrophic Xiaolin landslide in Taiwan: Evidence from pre- and post-landslide airborne LiDAR data

Yu-Chang Chan (1), Kou-Jen Chang (2), and Rou-Fei Chen (3)

(1) Institute of Earth Sciences, Academia Sinica, Taipei, Taiwan (yuchang@earth.sinica.edu.tw, +886 2-27839871), (2) Department of Civil Engineering, National Taipei University of Technology, Taipei, Taiwan, (3) Department of Geology, Chinese Culture University, Taipei, Taiwan

A catastrophic landslide occurred in 2009 and resulted in hundreds of casualties in the Xiaolin village in southern Taiwan as typhoon Morakot traversed the island. To better characterize the geologic structures of the landslide region, we carried out analysis of pre- and post-landslide airborne LiDAR survey data. The pre-landslide LiDAR-derived DEM shows no compelling evidence that a landslide would occur in such topography. The topography indicates that a similar event has occurred in the same area although the date of the landslide is not known. The post-landslide LiDAR-derived DEM, however, provides strong evidence for the presence of a joint set, a major strike-slip fault, and dip-slope failure of the region. These structures, particularly the joint set and the strike-slip fault, were not clearly exposed in the pre-landslide LiDAR-derived DEM. The observed structure pattern provides suitable geologic conditions for the catastrophic landslide to occur. In such geologic conditions, heavy rain reduced the basal shear strengths and subsequently triggered the landslide. Through comparisons between the pre- and post-landslide LiDAR-derived DEMs, we have calculated accurate volume change, erosion characteristics, and even estimated the landslide speed for this event. We conclude that geologic structures contributing to the Xiaolin landslide have been well identified through the post-landslide LiDAR-derived topography although they are less clear in the pre-landslide topography. The challenge now remains that how to better identify these geologic structures before the landslide occurs.