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A Time-Series Analysis of Sediment Transport in Tsaoling Landslide using Photogrammetry and SAR Interferometry

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Tsaoling Landslide is widely known among worldwide researchers due to its landslide prone characteristics and distinctive features. After its catastrophic failures firstly recorded in 1862, this area suffered from frequent catastrophic failures including the 1999 Chichi Earthquake. In this study, we firstly use aerial orthophotos from 1979 to 2009 to generate 6 digital terrain models (DTM) of Tsaoling Landslide at 2 m resolution. These surface changes were inspected by short-term evaluations after Chichi Earthquake (1999-2009). The evolution of the riverbed profile indicates that incision took place in the upstream section of the Chinshui River and deposition took place in the downstream section. This leads to that the river slope became milder ten years after the earthquake. Second, we attempt to track recent landslide movements from TerraSAR-X/TanDEM-X (TSX/TDX) Satellite to generate 4 DTMs with 3 m resolutions over the period from November of 2011 to April of 2014. This enables us to extend the post-seismic observation period from 2009 to 2014 with two different operations. Apart from photogrammetry, this paper has adopted an iterated DInSAR technique to generate DTMs of Tsaoling Landslide, and successfully extended the timeline of time-series analysis from 2009 to 2014 for a long-term analysis, in particular geomorphological changes and the current state of the main sliding area. The results show that erosions and deposits mainly occurred in unstable geological strata, such as Debris deposit, Cholan formation and Chingshui shale, during the rainy season when typhoons stroke the area with abundant rainfall.