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Failure Mechanism analysis of rainfall-induced landslide at Pingguang Stream in Taiwan: Mapping, Investigation, and Numerical Simulation

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On September 15, 2012, torrential storm carried by the peripheral circulation of Typhoon Sanba and the northeast monsoon induced a translational landslide near Pingguang Road in Xindian District of New Taipei City, Taiwan. The total volume of the landslide was approximately 162,000 m3. The sliding mass destroyed two houses across the stream and formed a landslide dam at the toe of the slope, constricting the stream. In this study, remote sensing images and LiDAR scanning were interpreted, and conducted onsite surveys to obtain material parameters, and performed simulations using the discrete element method to reconstruction the post event, in order to elucidate the mechanisms involved in the landslide process.

Survey results revealed complex geological conditions with wide spreading tension cracks at source area. This facilitated the infiltration of surface runoff into weak surfaces and raised groundwater levels. Once the shear strength falls below a critical value, failure surface will occur along the stratum boundary. The results of numerical simulation reveal that at 80 sec after the Pingguang Stream landslide began, a maximum deposition depth of 20 m had been reached. The sliding mass cut off the stream and pushed the stream flow roughly 35 m to the southeast. Because the slope materials surrounding the study area and the landslide-inducing mechanisms are similar, the top of the slopes to the northwest of the study area require monitoring immediately. In addition to filling in the tension cracks, drainage facilities should be constructed to prevent further landslides.

Keywords: translational landslide, onsite survey, discrete element method, mechanism, landslide process