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Using Distinct-Element Method (DEM) to Investigate Tsaoling Landslide Induced by Chi-Chi Earthquake, Taiwan.

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Large landslides occurred in the mountainous area near the epicenter on Sept. 21st, 1999, Chi-Chi earthquake in central Taiwan. These landslides were triggered by the Mw = 7.6 earthquake, which resulted in more than 2,400 people casualties and widespread damage. The 1999 Chi-Chi earthquake triggered a catastrophic Tsaloing landslide, which mobilized about 0.125 km^3 of rock and soil that slid across the Chingshui River and created a 5 km long natural dam. One fifth of the landslide mass dropped into the Chingshui River, the rest crossed over Chingshui River. At least five large landslides occurred in Tsaoling area are induced by big earthquakes and downpours since 1862 to 1999. Geological investigation shows that the prevailing attitude of sedimentary formation is about N50W with a dipping angle of 12S. First we used Newmark Method to calculate the stability of slope distinct-element method to simulate Tsaoling landslide (PFC^{3d} and PFC^{2d} discrete element code).

Because of the discrete, particle-based nature of the model, specification of material properties and boundary condition is more difficult than available continuum methods. The user may specify micro-properties that control particle-particle interaction, but have no way to directly prescribe the micro-properties of the model such as Young's modulus(E), unconfined compressive strength (UCS), Cohesion(C_0), Possion's ratio(ν), coefficient of friction(μ), porosity, and the initial stress state. As a result, the process of generating an initial model with the appropriate material behavior and initial stress state is by trial-and-error, requiring the use of numerical equivalent of a biaxial rock mechanics test rig to derive the rock mechanical macro-properties.

We conclude that the characteristics of Tsaoling landslide process are: (1) the rocks were bond together on sliding, and (2) the frictional coefficient was very small.