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Applying finite and discrete element analyses on a rainfall-induced landslide in mudstone.

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On September 28, 2016, Typhoon Megi struck Taiwan with torrential rainfall, causing a catastrophic mudstone landslide in the Yanchao District of Kaohsiung city. The total volume of the sliding mass was about 8,700 m^3, which damaged a house and caused three deaths. Before the 2016 Yanchao landslide, no large landslides had been reported in the mudstone areas of the Yanchao District. This study assessed the behaviors of the 2016 Yanchao landslide using finite element analysis (FEA) and discrete element analysis (DEA) [1]. Two numerical models were utilized to understand the landslide process from failure to deposition. Based on the results, the initiation time of the slope failure can be captured through the rapid change of source displacement (RCSD) in the pre-failure regime. In addition, the DEA result shows that the steepness of the slope directly influences the runout behavior in the post-failure regime. Our results demonstrate that incorporating FEA and DEA models is feasible to reproduce the initiation time and kinematic process of the 2016 Yanchao landslide. The concept can be further integrated with geohazard susceptibility data and help provide key information to inform government and public on the stability of mudstone slopes [2].

References:

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[2] Lin CH, Hung C, Weng MC, Lin ML (2019) Failure mechanism of a mudstone slope with steep anti-dip joints: Case of the 2016 Yanchao catastrophic landslide in Taiwan (under review)