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The displacement analysis of seismic slope behavior - from shaking table model slope to in-situ case

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The slope displacement behavior induced by seismic loads is the key index for evaluation of slope stability when subjected to earthquake loading. The seismic slope displacement provides better definition of the initiation of landslide and can be used for the potential analysis of landslide hazard. In order to simulate the slope displacement under earthquake, a small-scale shaking table was developed in laboratory, and 18 model slope tests were performed with various slope geometry, relative density, and acceleration histories. The seismic responses were recorded using accelerometers, CCD images and laser scanning before and after the tests. The dynamic analysis, particle image velocimetry analysis, and topography analysis were conducted based on the measurements. It is found that the displacement of the slope can be well established, which provides information for the displacement behavior of the slope subjected to seismic load. The displacement analysis using three different methods yield consistent results. Such techniques were applied to the results of 6 large-scale model slope tests subsequently. Further more, the results are compared to the field deformation data of the landslides induced by the Chi-Chi earthquake in 1999, which was determined from aero-photos, satellite images and field investigation.

Keywords: displacement analysis, seismic slope behavior, shaking table test, image analysis