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Development of slope failures at thrust fault scarps in analogue models: application to submarine landslides

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We conducted analogue model experiments that induced a thrust in the experimental material, dry cohesionless sand, and observed surface slope failures at the fault scarp. The model surface was sequentially photographed by a pair of digital cameras and these stereo-pairs of the images were analyzed with 3D digital image correlation (DIC) technique to examine the 3D topography, strain distribution and slope failures. Since the intergranular pore space is filled by single fluid both in the models (air) and in natural prototype (water), the results can be applied to submarine slope failures where the effects of water viscosity and dynamic flow behaviour of sliding body can be exempted.

A number of slope failures were detected in the models and the failures can be classified into two types, those occurred at the foot of the slope and those at the top of the slope. The surface dip of the 3D topograraphy revealed by the 3D DIC shows that steeply inclined regions can be observed at the foot and at the top of the slope, and the failures occurred at these two regions. The failures at the foot of the slope may be triggered by over-steepening by fault displacement, whereas the steep areas at the top of the slope correspond to scarps of large slope failures. The latter thus can be identified easily in later stages where the width of the slopes increases and exceeds the width of the lower slope failures.

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